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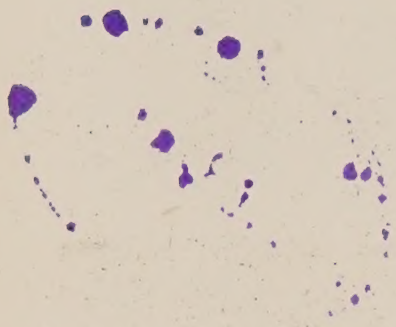

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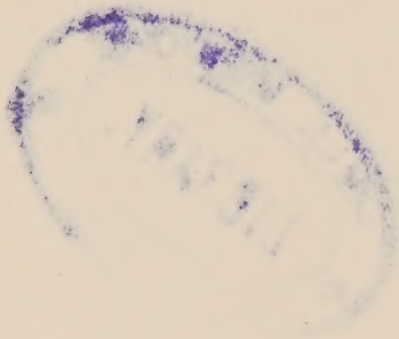

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A SYSTEM

OF

PRACTICAL THERAPEUTICS.

EDITED BY

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SYPHILIS.

By R. W. TAYLOR, M. D.

Syphilis is a chronic infectious disease affecting the whole organism, and characterized by the development of an inflammatory process of a low grade, and by the formation of a low form of cell-growth called granulation tissue. Though it is claimed that syphilis depends essentially upon a micro-organism for its virulence, and though its analogy with other chronic infecting granulation-tissue diseases, notably leprosy, supports that view, we are not to-day in the possession of a definite knowledge of any microbe which has been shown either by circumstantial evidence or experimental inoculation to be capable of producing the disease.

There are two well-marked forms of syphilis—the acquired disease, obtained by contact with a previous syphilitic; and the hereditary form, in which the infection has been transmitted from one or both parents to the offspring.

Acquired syphilis always begins with the development of a local lesion called the chancre, the hard or Hunterian chancre, the infecting chancre or sclerosis, the initial lesion, the primitive neoplasm, and the primary syphilitic ulcer. This in due time is followed by general manifestations of varied character, extent, and severity. Thus, for purposes of description we speak of a primary period of syphilis, which includes the interval between the infecting coitus and the appearance of the chancre, and the further lapse of time until the evolution of secondary manifestations. In general, this primary stage of the disease may be said to occupy a period of from fifty to eighty days. In the primary stage of syphilis the only objective phenomena are the chancre and the resulting enlargement and swelling of the lymphatics and ganglia anatomically connected with the infected area. By some the primary stage of syphilis is looked upon as its period of local infection, while with the evolution of the secondary stage the disease is said to become constitutional. The truth is, that infection of the organism begins as soon as the morbid matter is deposited upon it, and that involvement of the system goes on slowly until the climax is reached with the onset of the secondary period with its generalized lesions. We are not cognizant of the manifold and intricate morbid processes which form the culmination of the syphilitic infection of the organ-

ism, as shown in the onset, invasion, or explosion of the secondary period. Clinical facts and therapeutic deductions and teachings seem to warrant the view that by slow degrees a crisis has been reached; that the infection of the economy is now complete; and that we have at last a recognizable morbid constitutional condition. The primary period, therefore, is sharply limited. The secondary period covers a longer or shorter lapse of time, and although attempts have been made to state it with tolerable accuracy, it may be said that to-day no absolute chronological data can be laid down. The secondary period may last a few months or a year or more, during which the lesions are of the mild and more superficial character.

The onset of the tertiary period is correspondingly irregular; it may be early and it may be late, and it may never appear. From a therapeutic point of view, we thus being unable to draw sharp lines of demarcation between the secondary and tertiary stages, it is well in a general way to speak of secondary lesions as being peculiar to the first year or year and a half of the disease, and to consider the general diathetic condition of the time beyond that, and the lesion and symptoms concomitant to it, as evidences of a tertiary period. But, as we shall see later on, this division, which will answer well for very many cases, will be found to have many exceptions. As a broad generalization it may be safely stated that there is a well-marked line of treatment peculiar to the first year of syphilis, and that the indications for specific medication for periods beyond that date are well understood and can be quite readily attained. By this way of reasoning we advance toward simplicity.

In undertaking the treatment of acquired syphilis we are confronted with the following problems: First, can we abort or suppress the disease in the early stage by the destruction or excision of its initial lesions? Second, can we by a general preventive treatment suppress, abort, or favorably attenuate or modify it? If these procedures are found impossible, ineffective, or inexpedient, we come to a further question: Third, shall we begin general systemic treatment as soon as a positive diagnosis of syphilitic infection is made, or shall we wait until the evolution of the secondary period proves to us that the climax has at last been reached and that the whole organism is involved? Having settled these problems, we shall then be prepared, Fourth, to consider the question of the best methods and the best agents for the treatment of the disease, and, Fifth, to determine how long it is necessary to continue treatment.

Abortive Treatment.

Excision of Chancres.—Let us now consider the first question: Can we abort or suppress the disease by the destruction or excision

of its initial lesion? The idea of preventing syphilis by the destruction of the chancre is a very old one, dating as far back as the end of the fifteenth century. It was brought into prominence by the writings of Bell and Hunter toward the end of the last century. These famous surgeons taught that the chancre was always local, and that general infection did not occur immediately, but that it followed as an accident consecutive to the chancre. In spite of such strong statements, which by implication recommended the excision of chancre as a cure for syphilis, no clinical evidence of its use early in this century is at hand. The era of this prophylactic treatment may be said to begin with the publication of a paper by Hüter[1] in 1867, which, though sadly incomplete in many details, claimed the cure of two cases of syphilis out of seven in which the chancre had been excised. This paper may be said to have led the way to the generalization of excision of chancre as a means of attenuating, emasculating, delaying, suppressing, or aborting syphilis in its early stage. The theory of its action may be briefly stated to be based upon the supposed local character of the initial lesion which was thought to exist for a short time after its appearance. The opposite theory, of the immediate infection of the system, presupposed the entry of the virus through the lymphatic system into the general circulation, and its return to the point of infection, where it underwent a slow process of germination, and then again became generalized. This view was not supported by the facts offered by the evolution of syphilis nor by the clinical features of the hard chancre itself; therefore, this theory failing, the doctrine of early localization was quite generally accepted.

The opinions very generally held by advanced students and authorities in syphilis as to what takes place in the early stages of infection may be concisely stated as follows: That the virus is localized at its point of entry, and that the first stage of syphilis, or rather its first period of incubation (which means the interval between the date of the infecting contamination and the appearance of the chancre), is occupied by the processes which go toward the development of the chancre, and that this lesion is then the sole expression of the disease. The virus is then supposed to be limited to the chancre for some time—let us say from one to eight or ten days—and in this period annihilation of the disease is possible. Lang's[2] idea of the chancre is sharply stated, and conveys in a few words the prevailing sentiment of the past twenty years at least. He says that a morbid focus is developed, and

[1] "Excision der Ulcus Induratum," *Berl. klin. Wochenschrift*, No. 27, 1867; and "Zur Geschichte der Excision der Ulcus Induratum," *Centralblatt für Chirurgie*, Nos. 23 and 24, 1879.

[2] "Wege und Wundlungen des Syphiliscontagiums, et cet.," *Mittheilungen der Wien. med. Doctoren Collegiums*, xiv. and xv. Band, 1888–89.

at its periphery a cell-wall is formed which acts as a temporary barrier or blockade. In due time (during which the syphilitic virus is germinating and maturing) this melts away or disappears, and then the virus is carried into the surrounding parts by the lymphatics and the blood-vessels, and by slow contiguous tissue-infection. In this connection it must be mentioned that the experiment of Cohnheim had much to do with fortifying the view of the local nature of the young chancre. This observer threw into the anterior chamber of the eye of a rabbit, by means of a hypodermic syringe, a small quantity of tuberculous matter. For eight days no change whatever was observed, but after that date liquefaction and absorption took place, and in due time the infection of the whole organism followed. Under these conditions it is not strange that the belief in the prophylactic benefit of excision of chancre is extensively held, though it must be confessed that there are not a few who scouted the idea and claimed syphilis as a constitutional disease from the first.

Hüter's paper, already mentioned, while it marks an era, was not productive of great results in the utilization of this method, and it was not until the appearance of two essays by Auspitz[1] and Unna in 1877 that excision of chancre was extensively tried. These observers reported 33 cases in which chancres were excised, of which in 14 success was claimed, in 10 failure was conceded, and in the balance the records of essential facts were so incomplete that they were thrown out. The results here obtained, fortified by the high reputation of Auspitz, made a decided impression upon the medical world, and from this date excision of chancre was largely practised in Germany, and to a less degree in Italy and France. In America and England syphilographers looked coldly upon the procedure, which, it may appear strange to say, in their hands gave uniformly barren results. Auspitz and Unna's paper was followed by a second one by Auspitz[2] alone, in which he took the ground in an unqualified manner that the initial sclerosis should be looked upon as a symptom local in character. This assertion had certainly the greatest weight in causing the quite general adoption of excision of chancre as a prophylactic for syphilis. It had much to do with clinching in the minds of physicians the impression that at first the syphilitic process is a strictly localized one. The chancre came to be regarded as the concentrated effect of the virus, and that for contamination of the system to occur the changes inherent in it must go on to maturity before its poisonous elements could be scattered

[1] "Ueber die Excision der Syphilitischen Initial Sclerose," und "Die Anatomie der Syphilitischen Initial Sclerose," *Vierteljahresschrift für Dermat. und Syphilis*, 1877, pp. 107 and 200.

[2] "Ueber die Excision der Hunter'schen Induration," *Wiener med. Presse*, Nos. 50 and 51, 1878.

generally throughout the system. Auspitz and Unna were the first to bring out clearly the invasion of the vessels in the early stages of syphilitic infection. They, however, evidently reached the conclusion that the vessel-changes were limited to the area of the chancre, and that they only extended slowly beyond that circumscribed region during the latter part of the secondary period of incubation. Cornil's[1] views are also interesting. He says: "We cannot state it in an absolute manner, but we may venture the hypothesis that the syphilitic virus when deposited in the skin remains at first only locally active, but that it gradually affects cells in close contiguity, and prepares them for the hyperplasia which soon forms the chancre." It will therefore be seen that the prevailing ideas of the mode of syphilitic infection favored the view that the disease might be aborted. In the light of facts to be presented later on it would be a waste of time and space to give a general survey of the literature of excision of chancre. Any person desiring further information on this subject may consult the papers mentioned in the foot-note,[2] as well as those already referred to. The facts are briefly these: There have been reported about 460 cases in which excision has been performed, and in about 110 success has been claimed. I have not the slightest hesitation in saying that I do not believe that a single case of syphilis was ever aborted or annihilated by early radical procedures of any kind. Many of the cases reported as cured have undoubtedly been those of soft chancre, which for some reason had become the seat of œdematous hyperplasia; and others were undoubtedly cases of relapsing chancres *in sitû* (the pseudo-chancre, *induré* of Fournier), which are often seen late in syphilis, and commonly are not followed by any other lesions; while still others were in all probability instances of irritated herpes, which so often puzzle even the elect. I have several times seen acarian nodules upon the penis, and also on the outer female genitals, which had been pronounced even by intelligent physicians to be syphilitic neoplasms.

Then, again, besides the probable manifold errors in diagnosis of the excised lesions, in very many instances, the cases were examined too cursorily and for too short a period, or at too long or too frequent intervals. Auspitz himself stated that four months' observation was sufficient. It may be that some of my readers, even in spite of what is said in this essay, may think fit to try excision of chancre as a prophylactic in syphilis. If so, it is well for them to follow the requirements laid down by Fournier[3] in the study of this subject, which are as follows: "1. The man whose chancre is to be removed (and it must always

[1] *Leçons sur la Syphilis*, Paris, 1879, p. 15.

[2] The reader is referred to an article by Leloir, *Annales de Derm. et de Syphilographie*, vol. ii., 1881, p. 69, and to Kaposi's *Path. und Therap. der Syphilis*, p. 419, for a full bibliography.

[3] "Traitement abortif de la Syphilis," *Gazette des Hôpitaux*, No. 116, p. 1071, 1888.

be remembered that in these very early lesions the appearances are not sharply cast and a diagnosis is often difficult even for the expert) must be confronted with the woman from whom he derived his lesion, and she must be proven to be syphilitic. 2. A precise and clear period of incubation of from two to four weeks must be made out. 3. The observation of the case must be complete and well analyzed, and it must be proved [by microscopical examination—R. W. T.] that the excised lesion is a syphilitic chancre, and that the patient had not previously been syphilitic. 4. The patient must be carefully and at short intervals examined for a period of at least six months." Further than this, I may add that it must be proved conclusively that the patient has not taken mercury surreptitiously, for I can well understand that a man might seemingly consent to excision as a possible cure, and yet not care to take its chances, and for that reason take mercury on the sly.

The study of the question of the abortive treatment of syphilis will not be complete without the consideration of the bearing upon it of a number of cases recently reported showing an unusual mode of evolution of the disease. The following case, reported by Dubois Havenith,[1] will serve as a good specimen: A man sixty years old had coitus in the first days of July. Toward August 1st an erosion appeared on the prepuce which soon became indurated and caused phimosis. The diagnosis of infecting chancre of the prepuce was made. As the ganglia were not perceptibly affected, Havenith entertained the idea of circumcision as a means of aborting the syphilis. He sent the patient to Leloir, who confirmed the diagnosis and advised waiting until secondary manifestations appeared. Havenith has examined the man for a year every five days, and has seen no syphilitic manifestations. In the discussion of this case both Barthélemy[2] and Aubert stated that they had seen seemingly typical indurated chancres which were not followed by syphilis. In like manner, Burnett[3] reports a very striking case of a seemingly typical indurated chancre with inguinal adenopathy, both of which gradually disappeared without any treatment. Though carefully looked for at short intervals during a period of sixteen months, no evidences of syphilis were observed. Burnett quotes a similar case reported to him by Professor J. P. Bryson, and also a case of similar import reported by Kaposi.[4] A further case, reported by

[1] *Comptes Rendus du Congrès international de Dermat. et de Syphilographie,* tenu à Paris en 1889, Paris, 1890, pp. 474, 475.

[2] "Sur les Auto-inoculations du Chancre syphilitique," *Annales de Derm. et de Syphilographie,* 1885, p. 200, *et seq.*

[3] "Induration of Venereal Sores not always an Indication that Constitutional Syphilis will Follow," *Journal of Cutaneous and Genito-Urinary Diseases,* 1889, p. 325, *et seq.*

[4] *Syphilis der Haut und der Angrenzenden Schleimhaute,* Vienna, 1873, Lieferung 1, p. 22.

Ehlers[1] of Copenhagen, occurring in the practice of Professor Haslund, is also reported, in which examination for one year failed to reveal secondary manifestations. These facts are certainly very striking, and open up a subject as yet very obscure to us. I have seen several cases similar to those just reported, and although the objective features of syphilitic infection were complete, I have been disposed to look upon them as anomalous instances of simple localized hyperplasia. Perhaps, however, I am wrong. Burnett thinks these cases are instances in which syphilis became inert—as Barthélemy says, aborted—in the primary stage through influences which we do not understand, due to conditions of the organism or to a modification of the virus itself. Besnier,[2] however, is confident that some individuals, though inoculated with syphilis, do not become syphilitic, and he offers the following hypothesis: "When we consider the extraordinary immunity to syphilis presented by the entire animal kingdom, it occurs to us that some individuals, like animals, have in their physical condition, in an elementary condition of their solids and their fluids, something which is antagonistic to the germination of the syphilitic virus. The occurrence of such cases as these suggests the possibility that some of the reported successful cases of chancre excision were really instances in which syphilis aborted in its first stage. Then, again, the thought is suggested to the mind that if syphilis may really abort in its primary stage—in other words, if the patient's tissues are immune to its influence—have we not here another reason why it is well to withhold mercurial treatment until the general manifestations teach us that we have a case of syphilis on our hands?" This point will come up again later on.

In a report to the French[3] Academy of Medicine, Cornil, having gone carefully over the literature of the subject, pronounces excision of chancre futile, and he calls attention to the fact that its use may be dangerous, for the reason that a mercurial treatment may not be instituted and the disease will then run on unchecked.

The negative evidence as to the value of excision of chancre is very strong, and is offered by a number of observers. The classical case of Berkely Hill, in which he unsuccessfully cauterized a tear upon the penis within twelve hours after infection, is well known. Further than this, cases are reported by Razori, Coulson, Gibier, Mauriac, Thiry, Meyer, Zeissl, Zarewicz, Krowcynski, Bumstead and Taylor, and others in which excision was practised at periods of twelve to thirty-

[1] "Cas de Chancre induré non suivi d'Accidents secondaires," *Bullétin de la Societé Francaise de Dermat. et de Syphilographie*, 1890, p. 365, *et seq.*

[2] *Ibid.*, p. 367.

[3] "Rapport sur la Memoire addressé en response à la question suivantes: Precises sur une série d'observations sil existe un traitement abortif de la Syphilis confirmée," *Annales de Dermat. et de Syphilographie*, 1887, p. 60.

six and forty-eight hours after the appearance of the chancre, in which syphilis developed in its usual way. I have several times removed hard chancres within the first day of appearance, and in each instance failed to abort syphilis. The following personal case well illustrates the average of cases of chancre-excision and its results: A gentleman, aged thirty, came to me early in 1889 in great distress of mind concerning a lesion on his penis which he had noticed for the first time the night before while taking a hot bath. The reason of his fear and worry was that a friend had a few days before informed him that he had contracted a hard chancre from a woman with whom he had learned that he (my patient) had had intercourse. Upon examination I found on the dorsum of the penis a very minute ($\frac{1}{10}$ inch long) fissure of a dull violaceous color. I could discover no change in the inguinal ganglia. At his urgent request I examined the woman and found just within the vagina, in the sulcus on the right of the urethra, a red and inflamed patch, the seat of considerable thickening. In the light of what I found besides I diagnosticated it as a declining hard chancre, of which I had seen many similar before. There was marked inguinal adenitis and a very faint disappearing roseola, a mucous patch on the right pillar of the fauces, and slight fall of hair. The certainty of the syphilitic nature of the sore on the patient's penis, which appeared seventeen days after coitus, being so convincing, its probable character was announced to him. The condition of the skin of the penis was such that the little fissure could be cut away by means of a very liberal elliptical incision, and no harm would be done to the integrity of the organ. Under the most careful technique, with thorough antisepsis, I excised a piece of skin half an inch wide and three-quarters of an inch long on the evening of the day on which the fissure was first noticed and seventeen days after the infecting coitus. Examination of the patient was made almost daily. The wound healed kindly under iodoform gauze, and was not followed by any induration in the minute scar which was formed. It was fully twenty days after the operation that well-marked inguinal adenopathy could be made out. In fifty-two days after the first appearance of the chancre well-marked secondary manifestations were observed.

A very similar case has already been reported by me. Prior to June, 1891, therefore, while the majority of syphilographers believed in the absolute futility of chancre-excision as a means of aborting syphilis, a few still believed in its efficacy in some rather exceptional cases. In May of the same year I read a paper[1] before the Academy of Medicine of New York, in which I think I clearly showed why syphilis is not aborted by chancre-excision. The gist of this paper is as follows:

[1] "Why Syphilis is not Aborted by the Early Destruction or Excision of its Initial Lesion," *Medical Record*, July 4, 1891.

I had had the good luck to be able to remove a hard chancre on the extreme edge of the prepuce, together with the two layers of the prepuce. Thus I had a lesion, and besides it the skin for a distance of more than an inch from the site upon which it was placed. The history of the infection was clear and striking, and proved that the ulcer had appeared fourteen days after coitus. It was seen by me within a few hours of its first appearance. Four days after that the prepuce was ablated, which was exactly eighteen days after the infecting coitus. Seventeen days after the appearance of the chancre inguinal adenopathy was discovered, and in thirty-two days after that manifestation generalized syphilitic symptoms showed themselves. Thus it will be seen that the ablated prepuce was particularly precious, for it contained an initial lesion of syphilis only eighteen days old, and beyond it and proximal to the body an inch and a half of tissue which looked perfectly healthy, and in the light of our knowledge of syphilitic infection would have been considered to be free from the disease. This specimen I placed in the hands of Dr. Van Gieson, with the view of ascertaining the appearances of the initial lesion at its very earliest period of development, and also of finding out, if possible, why under such favorable circumstances its excision had failed to abort syphilis. In order to make the study more complete and perfect, I also gave Dr. Van Gieson a prepuce upon which was seated a chancre ten days' old, which appeared sixteen days after the infecting coitus. This lesion was therefore the evidence of an infection which took place twenty-six days before. The examination of the eighteen-day-old specimen showed that the chancre consisted of a little mass, quite well circumscribed, of small round cells, and was in every way typical of the appearances of an initial syphilitic lesion. But, besides this, it was found that well down under the chancre the small veins were surrounded by this same round-cell infiltration. Then, beyond the margin of the chancre, in skin which to the eye seemed normal, this same infiltrating and infecting process was very clearly observable. This same state of affairs existed in the whole prepuce, and how much farther on the penis it is impossible to tell. The appearances presented by the second twenty-six-days-old specimen were confirmatory of those of the first, showing this vessel-implication far beyond the outer margin of the chancre. These studies therefore go to show that in the very first days of syphilitic infection the poison is deeply rooted beneath the initial lesion, and that it extends far beyond its margin—that it is in a most active state, and, running along the course of the vessels, it soon infects the parts beyond, even to the root of the penis. To my mind, therefore, the facts adduced show very plainly that the infection-process in syphilis is from the very beginning one of constant growth and diffusion. The observations presented in my essay therefore showed that the syphilitic

poison was copiously and extensively diffused through the tissues of the penis by means chiefly of the small veins, arteries, and lymphatics. In confirmation of these observations the results of the studies of the so-called lymphatic cord of syphilis by Dr. Külneff[1] of St. Petersburg are very important, since they show the more advanced stages of this peculiar vessel-change, and of the further progress of syphilitic infection. Külneff excised portions of five of these cords taken from patients having true hard chancres about the prepuce and glans. The cords varied in size from a knitting-needle to a lead pencil, and were from a fortnight to ten weeks old. Külneff concludes that the cord occurring in cases of primary syphilitic sclerosis results from inflammation of the subcutaneous veins of the penis. In other words, it is a manifestation of syphilitic endo- and peri-phlebitis. The morbid process commences primarily in the vein, probably in its interior, and from it infiltration of granulation-cells occurs. In short, the results of the examination of my cases dovetail completely and conclusively with those of Külneff, who studied the syphilitic process farther up the penis in the larger vessels, which were the seat of a more advanced infection. The conclusion is warranted, I think, that the changes which take place in the chancre and small radical vessels run up quite promptly to the larger efferent vessels, and that largely through them is the poison diffused into the system.

These clinical and pathological observations therefore show why syphilis is not aborted by early excision or destruction of its initial lesion, even including a liberal slice of the surrounding parts. The reason, succinctly stated, is, that (contrary to the prevailing views) the syphilitic infective process is from the very start a quite rapid one. The poison strikes directly for the blood-vessels, and, causing there its peculiar changes, runs along them with astonishing rapidity. Thus it gains a foothold in parts beyond the reach of the knife, caustics, or electrolysis. In fact, the tissues of the whole penis in very early syphilis are, we may say, honeycombed by these infected vessels. These observations, supported by the evidence of the failure in chancre-excision, go to show that beyond the chancre there is sufficient syphilitic poison to infect the whole system, and that the initial lesion, through the visible and exuberant evidence of syphilitic infection, may be removed without in any way altering or modifying the course of the disease.

In my judgment, therefore, irrefragible proof has been offered which clearly shows the absolute futility of excision of chancre as a prophylactic of syphilis. It is necessary, however, as a matter of

[1] "On the Question of the So-called Lymphangitis in the Early Stage of the Primary Syphilitic Sclerosis," *Inaugural Dissertation.* (Under the auspices of Professor Tarnowsky.) St. Petersburg, 1889.

history, to record here in a brief manner the further and more radical operations which have been proposed for the extinction of syphilis. The recital will certainly act as a warning to future experimenters and theorizers, particularly if they will read what has just been said of the early stage of syphilitic infection. In 1871, Vogt[1] proposed that in addition to the extirpation of the chancre, a like operation should be performed upon the inguinal ganglia. In the year 1872, Hardaway[2] in an elaborate paper showed that, according to existing views, syphilitic infection took place through the lymphatics, and arrived at the logical conclusion that extirpation of the ganglia, in connection with the chancre, offered a reasonable chance of aborting the disease. He simply made the suggestion, unsupported by clinical evidence. Bumm,[3] however, in an article advocating chancre-excision, detailed seven cases in which the ganglia were extirpated, and in two of which he claimed that he had aborted syphilis. The next noticeable article on this subject was by Leuf,[4] who in an essay based on theoretical grounds regarded excision of chancre as only a halfway measure, and advocated the extirpation of the lymphatics of the penis and also of the lymphatic ganglia. Seeing that no harm has been done, both Hardaway and Leuf may be pardoned for their chimerical proposals.

In this connection it may be interesting to remember that Neumann[5] recently showed a case of a man in whom he removed the chancre and the inguinal ganglia on the thirty-first day after the infection. Secondary lesions promptly appeared, followed later on by tertiary manifestations, which Neumann exhibited to the Vienna Medical Society.

This operation, if performed, occurs at an epoch in a patient's lifetime in which every effort should be made to place him in a position of superior mental and physical health, and when anything which may act as a shock or drain upon his system must be most sedulously avoided. For these reasons alone it is to be shunned. The operation is based upon false ideas of the pathology of syphilis. In the first place, it assumes that the virus of syphilis is in a fluid form, germinated and developed in the initial lesion; and in the second place, that this fluid virus runs up the lymphatic vessels of the penis without exudation or leaking, as Croton water runs from the reservoir to our houses. Now, the truth

[1] *Berliner klinische Wochenschrift*, 1871, No. 38.

[2] "The Pathology of Early Syphilis," *St. Louis Medical and Surgical Journal*, May, 1872; also, "The Lymphatic Theory of Syphilitic Infection, etc.," *N. Y. Med. Journal*, vol. xxvi., 1877; and "The Radical Treatment of Syphilis," *ibid.*, Sept. 26, 1885.

[3] "Zur frage der Schanker-excision," *Vierteljahr. für Derm. und Syphilis*, 1882, p. 259, *et seq.*

[4] "On the Eradication of Syphilis during the First Stage by Surgical Means," *N. Y. Med. Journal*, July 11, 1885.

[5] "On the Excision of Primary Sores and Enlarged Glands," *British Med. Journal*, May 19, 1890.

is, that the syphilitic virus or poison is an entity, and while it may, and perhaps does, contain a fluid plasma, undoubtedly, as shown by the microscope, it is made up of peculiar infecting cells, and the process of systemic invasion depends upon the peripheral increase of the original infected area. Secondly, this invading poison, whatever it may be, does not infect the system through two or more closed channels or pipes (lymphatics), but like an army with the skirmish-line thrown out, followed by the invading body, is powerful along its whole line of advance. In this way the whole system becomes infected, and the culmination is reached at the period of generalized manifestations.

Extirpation of the ganglia, therefore, is not in any way indicated by the pathology of syphilis, and it may be classed with many other surgical vandalisms which unfortunately to-day are too frequently perpetrated.

It may be stated, however, that in some cases, where the anatomical arrangement of the parts warrants it, excision of chancre may be performed with benefit, thus removing a conglomerate mass of infection and a lesion in many instances slow to disappear.

We come now to the second question: Can we by a general preventive treatment suppress, abort, favorably attenuate, or modify syphilis? Within a few years a method of treatment has been advocated which has for its purpose the eradication of syphilis by the prompt and vigorous use of mercury as early as possible in the primary stage. This treatment is really not new, since it is the same as that advocated by Fournier, Bäumler, Mauriac, and others, who give mercury just as soon as the diagnosis of syphilis is made. If there is any difference between it and other methods, it is that the advocates of a general preventive treatment put a little more energy in their words, if they do not in their mercurial, and support their method by pleasing (to some) sentimental talk. The eminent surgeon, Mr. Jonathan Hutchinson, has within a few years published a very interesting paper on this subject, which does for it all that ingenuity of argument can do. Mr. Hutchinson[1] says that "if a scheme of treatment, begun in the primary stage, is planned to prevent the secondary phenomena, and generally does so, it may, I think, be fairly styled abortive in contradistinction with others which make no pretence to prevent the ordinary evolution of the malady." Certainly, such a treatment might be called abortive if it did prevent secondary manifestations and stamp out the disease, but no one thus far has given us any evidence that such a treatment has produced such a result. Mr. Hutchinson says that we must not strain the word "abortion" to mean utter annihilation, and he concedes that after his early and active medicinal dosage (using

[1] "On the Abortive Treatment of Syphilis," *British Medical Journal*, Feb. 25, 1888; and "The Modern Treatment of Syphilis," *The Practitioner*, June, 1891.

gray powder) he sees, somewhat exceptionally, scaling patches on the palms of the hands, sores in the mouth, and sometimes a general rash; and again, in some cases, tertiary lesions. As a matter of fact, therefore, he has seen the secondary stage delayed and the third stage not prevented. Seeing that such early and late manifestations have really appeared after the trial of a well-ordered and vigorous early preventive mercurial treatment, the thought obtrudes itself upon us that in cases in which such an early treatment has not been followed by general manifestations a simple non-syphilitic sore, in its incipiency, has been diagnosticated as a hard chancre. It is very often impossible for many days to say that a given sore is syphilitic, though it may present a specific appearance. Consequently, the liability to error on the part of those who in the very earliest days of a sore begin mercurial treatment is very frequent and very great. But an attentive reading of Mr. Hutchinson's paper has convinced me that his abortive method is a treatment of sentiment rather than of reality. He tells us that the early free use of mercury causes the indurated nodule to melt away with astonishing rapidity—a fact which can very frequently be verified by any one. But it must be remembered that this induration is not a very early sign or symptom of syphilis, considering the requirements of this early abortive treatment. It may be stated, I think, without fear of contradiction, that when we encounter a well-marked indurated nodule, that lesion is at least two weeks, and more probably three or even four weeks, old. Induration in a few cases occurs quite rapidly, but in most cases, particularly in private practice on careful and cleanly persons, the initial sore is soft, or, rather, not appreciably hard, for one or two weeks and sometimes for a longer period. After that time induration may develop more or less rapidly. Therefore, I am led to think that in many cases Mr. Hutchinson's abortive treatment merely antedated the evolution of the secondary period by a short time. Then, again, Mr. Hutchinson speaks of the early involution of the syphilitic fever under active mercurial treatment as being an evidence of the early abortion of the disease. It is true that mercury will lower the temperature in early syphilis, but it is none the less true that this rise of temperature is generally concomitant with the appearance of general manifestations, though in some cases it may be observed a few days or a week, or at the most ten days, before that critical period. Here, again, we have in Mr. Hutchinson's paper intrinsic evidence that while he entertained the idea that he could abort syphilis in some cases, he only began the treatment at about the same time that others usually begin it. I have taken the pains within a few years to question carefully a number of gentlemen who begin the use of mercury early, or who rely upon its early use, as a means of aborting syphilis, with a view of ascertain-

ing just how soon in the life of the sore or in the evolution of syphilis they begin a mercurial treatment, and I found them divided into two groups: in the first are those who as soon as they see a sore which they regard as suspicious immediately give mercury; and in the second those who are more careful and scientific, and who by their own confessions admit that they allow days and weeks to elapse in many cases pending the verification of the diagnosis of syphilis. So that I am led to think that while many men cajole themselves with the idea that they begin the treatment of syphilis at once, really, for one reason or another (chiefly those of doubt and uncertainty), they usually wait wellnigh up to the date of secondary manifestations, if not, indeed, up to it, before they begin general mercurial treatment. They pass current, however, as advocates of early mercurialization. The truth is this, that in the hands of most men who are careful and conservative the disease is well on to its stage of generalization before treatment is instituted.

A method of general abortive or preventive treatment of syphilis has been worked out by Bronson on a purely theoretical basis. Bronson[2] thinks that we may cause the rapid disappearance of the initial lesion and the probable abortion or prevention of the secondary stage by hypodermic injections around and under the nodule on the penis into the substance of the inguinal lymphatic ganglia, and into the territory of integument "whose lymphatic vessels tend in their course to the ganglia which are the seat of the disease." This theory was perhaps tenable in the days when we thought that the chancre was the circumscribed focus of deposit of the virus, that the lymphatic vessels were its means of transportation, and that the nearest ganglia were the storehouses of the ripening infection. But to-day we know, as shown in the preceding section, that the virus of syphilis is scattered generally on and in the small vessels, and that it rapidly diffuses itself, passing at an early date by the veins into the abdomen. Practically, the injection of mercurial solutions under the chancre and under the skin of the penis will turn out in any one's hands a failure, and a source of discomfort, suffering, complaint, and lamentation on the part of the patient. Though this procedure was advocated by Weisflog, Lipp, and Lewin some years ago, I have no knowledge of its adoption and use by any one. Therefore I think that Dr. Bronson's charmingly written essay, which ends with this passage, "Better it is to act on any chance, however slender, than be bound helplessly to a dogma that is open to question, and that would leave the victim of an insidious infection without succor and without hope during what may be the most momentous period of his disease,"

[1] "On Preventive Treatment of Primary Syphilis," *New York Medical Journal*, March 24, 1888.

will go to posterity as a sample of good English composition and of humane inspiration, rather than as a watchword against a supposed lethargy in the therapeutics of syphilis. In my judgment, the early preventive treatment is barren of beneficial results, and leads to all sorts of errors regarding all kinds of sores found on the human genitals. I have never seen, nor have I heard of, a well-detailed authentic case of syphilis thus cured, and I doubt whether I ever shall. Consequently, I am not a believer in the practical application of Fournier's dictum, that it is easier to prevent than to cure. I agree with Kaposi regarding the early preventive treatment of syphilis, that it is rational and humane, but not practical.

In support of what I have said I think it well to present the views of a number of eminent authorities. Thus, Kaposi[1] declares that early treatment does not prevent the appearance of the general symptoms, but only delays them, that the symptoms appear irregularly, and that mild eruptions do not occur exclusively, but that there may be very early severe symptoms. Not alone is the development of severe symptoms, especially those of the central nervous system, accelerated, but in rare cases, in which severe early symptoms remain absent, injury results to the patient in that the syphilis runs a much slower course than when no early treatment has been adopted. Doutrelepont[2] very correctly states the case when he says: "Sometimes very disagreeable gummous forms appeared, although the milder secondary symptoms had remained absent." Neumann[3] also states the facts very clearly when he says that while cutaneous eruptions and enlargement of the ganglia predominate when there has been no early preventive treatment, after the latter we find that the mucous membrane of the mouth and pharynx, especially the lips and tongue, are particularly apt to present patches (and ulcers) in spite of the most careful local treatment. He found that the rash is delayed about sixty-two days, and I have seen it appear as early as that, and as late as ninety and one hundred and twenty days. He rightly concludes that the success of the early preventive treatment is ephemeral, and that notwithstanding its adoption syphilis will inevitably run its course. Further than this the words of Kobner[4] are of great significance. This observer up to the sixties of this century followed the routine then in vogue—namely, early preventive treatment—and he declares, with large experience, that he has seen only two cases in which the outbreak of general symptoms was apparently entirely prevented. In all other cases he saw syphilis run its course in spite of a

[1] "Ueber Therapie des Syphilis," Separat abdruck aus der *Verhandlungen der Congresses für Innere Medizin*, Wiesbaden, 1886.

[2] *Ibid.* [3] *Ibid.*

[4] *Ibid.*, and "Aphorismen zur Behandlung der Syphilis," *Berlin. klin. Wochenschrift*, Dec. 29, 1890.

most active inunction-treatment during the primary period. He further says that, unfortunately, he has frequently observed that those individuals who had received inunctions immediately after the diagnosis of the primary lesion exhibited disproportionately early severe and fatal symptoms on the part of the central nervous system. Equally as significant are the words of Bärensprung,[1] who says: "I have seen the most severe and rapid destruction almost always in those cases in which inunctions were used against the primary or first secondary lesions;" by which latter he means the inguinal adenopathy. Diday also is opposed to an early preventive treatment, and Leloir concludes that it is productive of no good. Finally, I may quote the recent utterances of the younger Zeissl,[2] who voices the opinion of his deceased father as follows: "As a compensation for the few days delay in the outbreak of the general symptoms these run an irregular course, and severe forms occur early. A further disadvantage of mercurial preventive treatment is the fact that the syphilis becomes more obstinate in so far as the symptoms of the condylomatous period yield much more slowly than if mercury has not been used until the appearance of this stage. We have therefore achieved nothing by preventive treatment, except to weaken our chief weapon against syphilis." Further evidence certainly is not necessary. I can confirm from prolonged observation and experience all that these authorities have said and claimed as to the inutility, general unadvisableness, and even danger of an early preventive treatment.

Systemic Treatment.

The Time to Begin Treatment.—The next question for consideration is the following: Shall we begin general systemic treatment as soon as a positive diagnosis is made, or shall we wait until the evolution of the secondary period proves to us that the climax has at last been reached, and that the whole organism has been involved? We have already seen that no clear evidence has been adduced proving that an early mercurial course can abort or favorably modify the syphilitic infection; and it has been shown that, in spite of such treatment, early and late lesions have appeared. This fact has been observed by many physicians. As I have already said, it is very probable that few authorities follow the letter of the law which they lay down—namely, to begin treatment at once as soon as they are reasonably certain that they have syphilis to treat. Though the advocates of this method of procedure are quite numerous, those who counsel delay until all possible doubt of diagnosis is removed are even more

[1] *Die Hereditäre Syphilis*, Berlin, 1864, p. 17.

[2] "Der Gegenwärtige Stand der Syphilis-therapie," *Klinische Zeit und Streitfragen*, Vienna, 1887, p. 173.

numerous. These advocates of early treatment base their view largely on sentimental grounds, and do not present strong, telling facts in their support. They picture a patient in the meshes of a severe chronic infectious disease, and claim that the dictates of humanity call for its early eradication. On the other hand, those who advocate a policy of delay are equally as much impressed with the gravity of the patient's position, and are equally ready and zealous to help him; and they think that they can do so with more certainty by waiting until they have a distinct morbid entity to treat than they can if they begin the use of mercury when the disease is yet in an unsettled and mythical condition. At best, early treatment only delays the appearance of secondary manifestations for a longer or shorter time, and as a rule does not lessen the severity or extent of their distribution, and in many cases seems to render them more severe. And when we have said this we have said about all that we can in favor of the treatment of syphilis, early or late, in its primary stage. On the other hand, it is the consensus of opinion of very many eminent men, as we have already seen, that this early treatment is really productive of harm, in the fact that it induces a disorderly course of the disease.

Moreover, early treatment takes from the physician at the outset —which is the most important period in the life of the syphilitic —those criteria which are to guide him in the management of the patient, and very often leaves him in a very uncertain and uncomfortable state or condition of uncertainty and doubt as to whether his patient is really syphilitic. Then, again, when a patient has been pronounced to be syphilitic he himself generally wants to see some undoubted signs and symptoms of the disease. I have many times seen patients who had received early mercurial treatment, and had witnessed no other evidence of syphilis than a chancre, cease treatment or refuse treatment after the lapse of a month or two of early mercurialization, and later on develop severe, and even deadly, lesions. Many patients, seeing nothing on their bodies in the early months of the infection (as a result of early treatment), convince themselves that they never had syphilis, and others remain in doubt, and in very many cases they will not follow subsequent treatment in the persistent and methodical way which is so essential for the cure of the disease. These cases have a surfeit of treatment very early in the disease, and an absence of it later, so that while they are not the gainers by the early medication they are often, to their sorrow, the losers by the absence of treatment at subsequent periods. Further, we must, as Von Düring[1] remarks, consider fully the mental injury inflicted upon a patient by a premature, and perhaps unfounded, diagnosis of syphilis, which causes him during his whole

[1] "Frühbehandlung der Syphilis oder Nicht," *Monatshefte für Prak. Dermat.*, vol. ix., 1889, p. 490.

life to be in constant dread of relapses, and, I may add, to be in a state of mind which attributes to his early (perhaps putative) syphilis every lesion or affection, however simple, which may thereafter befall him. To my mind, it is most salutary for the syphilitic to be convinced beyond any doubt that he is syphilitic, for in most cases the revelation brings him to a realization of his true condition, and impresses upon him the necessity of care and watchfulness as to his mode of life and docility to his physician, in order that in due time he may be cured.

Let us now turn to the pathological condition which syphilis presents. It is chronic and infectious in character, and manifests itself by the development of a low grade of connective tissue, which tends to indefinite reproduction in greater or less degree through periods of activity and remission in any and all of the tissues and organs of the body. In all probability the malign influence of syphilis upon the human organism is directly due to the infiltration of this tissue, to the irritative and inflammatory conditions incident to the hyperæmia which accompanies this proliferation, and last, but far from least, to the secondary destructive and atrophic changes which take place in the tissues in the various metamorphoses of these specific new growths. Clinical and pathological observations have shown that mercury possesses a specific power over this low grade of infectious tissue, and it is very probable that it causes its necrobiosis or its burning up, or that it produces its removal by the induction in it of fatty degeneration, which renders it ready for absorption. In my judgment, syphilis is not mature until the date of secondary manifestation, when the newly-formed young round cells are proliferated in vast quantities, and are thrown into the general circulation, and by it carried throughout the body. In the same way in the acute infectious diseases smallpox is not ripe until the evolution of the pustular rash, nor scarlatina until the appearance of its intense generalized erythema. When, therefore, the morbid processes have so far advanced that a generalization of their products has occurred, syphilis may be said to be ripe, and then, and not till then, have we anything really tangible to treat. Mercury given before this critical cell-explosion has very little to work upon, and therefore is productive of a limited amount of good. Indeed, to my mind, when given thus early, while it may have some influence upon local processes (namely, on parts the seat of the chancre and the adjoining territory), it is productive of harm by influencing the tissues too early, which influence does not give them an immunity to the subsequent syphilitic process of invasion. In other words, mercury given before the generalization of syphilitic products does not favorably influence the resistance of the tissues to the impending invasion, and certainly does not render them immune to it. On the contrary, the early exhibition of mercury induces a condition of tolerance in the

tissues which renders its action less powerful and certain at a later date when they are infiltrated with syphilitic products. In short, we take the cutting edge off of our most potent remedy by administering it to a system as yet not charged with the virus which it is our hope to destroy. We are really treating before we have got anything to treat.

We very frequently see a parallel condition later on in syphilis in patients who have for long periods taken small and continuous doses of mercury, and in whom (as so often occurs) syphilitic new-growths appear in the skin and elsewhere. In these cases a low grade of mercurialization is induced which has no power at all over syphilis, since its lesions appear notwithstanding the fact that the patient is taking mercury regularly. Now, this mercurialization tends to lower vitality and impair nutrition, and the general condition which it induces ties our hands, so that we can do very little good with mercury until the system has been renovated; then by the use of proper doses of the drug the syphilitic lesions may be made to yield.

There is another important consideration. In the primary period of syphilis it is well to prepare for the secondary stage by fortifying the patient's system, by putting him in a good physical condition, and in preparing the stomach, if necessary, for the ordeal which it will have to pass through. In this primary period in very many cases tonics and remedies designed to improve digestion should be given. Then in due time mercury will be well borne, and it will promptly act upon the syphilitic virus and its effects.

I have carefully studied this question for more than twenty years, and I am now more than ever convinced that it is by far the best plan in most cases to wait until the onset of the secondary stage before we begin a mercurial course. In thus waiting it must be remembered that we are not to fold our arms and do nothing; we must regularly examine our patient; we must look after his general well-being, mental and physical, encourage him with hopeful prospects, and prepare him for his coming ordeal, the crucial one perhaps of his life. Then, just as soon as general symptoms and manifestations begin to appear, and we know that we are right and appreciate fully what we have got to treat,—then we must begin our mercurial treatment with vigor tempered by watchful care of our patient and an enlightened and conservative knowledge of therapeutics.

While, therefore, it is best to begin the treatment of syphilis at the very earliest moment of the secondary period, there are conditions or exigencies which arise in the primary period which call for, and sometimes demand, the very early administration of mercury. These may be summed up as follows:

1. When the initial lesion from its site, size, depth, or extent causes

much pain and discomfort or interferes with the function of parts, or from activity of ulceration threatens to destroy them—prepuce, penis, urethra (chiefly in cases of phimosis and paraphimosis), clitoris, fingers, eyes, nose, lips, tongue, tonsils, breast, and anus. Also in cases in which dense induration around the urethral orifice or in the urethral canal produces a stenosis of that canal, and again in cases of very large (elephantine) extra-genital chancres upon the legs, arms, buttocks, and cheeks or face.

2. In some cases in which there is a tendency to the development of exuberant indurating œdema around the chancre, which may seriously discomfort or cripple the patient or impair the functions of the part, as we sometimes see in chancres of the lips, near the frænum, and upon the external female genitalia, and complicating chancres of the anus, and also in cases of chancres just within the vaginal introitus.

3. In certain of those cases in which, from its situation, the chancre may lead to infection of others, such as the fingers of surgeons, obstetricians, dressers, orderlies, and midwives, the nipples of wet-nurses and others who suckle children other than their own, in cases of chancre of the lips and tongues of infants, and in cases in which the lesion occurs on the lips or elsewhere of young, careless, and thoughtless persons who are liable to spread the infection.

4. When the enlargement of the lymphatic ganglia or the lymphatic cords (particularly of the penis) is excessive and causes inconvenience, impairment of function or locomotion or movement of the arms, or produces much discomfort and disfigurement in the neck and submaxillary region, at the elbow, in the axillæ, and groins.

5. In some cases in which chancres are complicated with a pyogenic infection attended with pain, fever, and perhaps typhoidal symptoms, chiefly on the fingers, but also, though rarely, on the nipple and mammæ, and sometimes on the penis and vulva (in careless, uncleanly subjects). Also in some cases in which gangrene and phagedena are complications.

6. In cases in which conjugal or sexual relations render the disappearance of the chancre necessary or imperative.

7. When the extreme anxiety and fear and the unreasonable impatience of the bearer render it imperatively necessary.

8. In those somewhat exceptional cases in which severe cephalalgia, neuralgia, pleuritic and interthoracic discomfort and pain, pains in the bones, joints, and fasciæ, are precocious.

9. In cases of women infected in the early months of pregnancy, in order, if possible, to prevent subsequent abortion; and in cases of chancre of the vulva and introitus vaginæ in order to remove a possible obstacle to childbirth, and, if very late in gestation, to prevent the infection of the child *in transitu*.

Kaposi[1] says that whenever he has been led astray by logic or external conditions to adopt a general treatment by mercury before the onset of the second stage, he has been sorry for it afterward; and my experience in the main accords with his. In these early medicated cases there are always, of necessity, data and criteria lacking, and as a result the physician does not feel as certain of his ground as he does when he and his patient have seen the earliest general manifestations of syphilis, and when he has by their observation and study gained a pretty clear general idea of what course the syphilitic infection is going to take.

To sum up, then, we may state that in most cases no advantage or possible benefit to the patient is lost by withholding mercury until the onset of the second stage, nor is the patient thereby put in any jeopardy, present or future, nor are his chances for ultimate permanent cure in any way impaired, modified, or crippled. On the other hand, his syphilis will be more orderly, and conspicuously more amenable to treatment, his physician will not grope in the dark, and will, if he promptly attacks the disease in the conservative but vigorous manner soon to be detailed, be spared the hesitancy, doubt, and uncertainty of mind which are the inevitable lot of those who attack the disease prematurely.

The date, therefore (as a general rule), at which the treatment of syphilis should begin is that at which the disease culminates in the general infection of the economy—namely, just as soon as the general rash appears, together with the other manifold symptoms of the secondary period.

MERCURY.—The experience of more than three hundred years has shown, in no uncertain manner, that mercury has the most marked and salutary effect in the treatment and cure of syphilis, and that if properly handled it may almost be termed an antidote or specific for that dread and protean disease. Though sarsaparilla, guaiac, saponaria, stillingia, smilax, chinæ, sassafras, dock-root, cascara amarga, berberis aquifolium, tayuya, and other vegetable agents, as well as preparations of gold, silver chromate, etc., have from time to time been put forward and vaunted as the true specifics, they have none of them attained a firm standing in the therapeutics of syphilis, and have each been abandoned as powerless and worthless. To-day there are few authorities who decry or inveigh against mercury, whereas fifteen or twenty years ago the doughty, noisy, illogical, and bigoted disciples of old Ulrich von Hütten were ever ready with their imprecations against the drug, and with their false assertions as to its dangerous and even lethal character.

Mr. Hutchinson,[2] referring to British medicine, says: "Excepting in Edinburgh, I believe that there are at present in the profession

[1] *Loc. cit.*

[2] "The Modern Treatment of Syphilis," *The Practitioner* June, 1891, p. 403.

scarcely any anti-mercurialists left, and I may remark, in passing, that during the last few years some of the most severe cases of syphilis which I have seen have come from Edinburgh, and had been treated in the early stages by systematic abstinence from mercury." I know of no anti-mercurialists in America.

Used carelessly and in the unstinted manner of old times, mercury certainly may be productive of harm; but in no department of medicine have more advances been made and more enlightened conservatism been engrafted than in the treatment of syphilis by mercury. In place of the powerful doses and inevitable salivation and other bad results arising from the use of mercury as given years ago, we to-day use milder doses, which produce amelioration and cure of the disease without, as a rule, untoward complications. While it may be said that the modern attenuation of the dosage of mercury has been an incalculable advance in syphilis therapy, it must also be confessed that in the hands of some physicians this attenuation has gone on almost to the point of emasculation. In other words, in the reaction from the rash and vigorous mercurial dosings of other days some observers have jumped too far, and to-day give mercury with so sparing a hand, and with so much mystifying arithmetical calculation, founded on theory rather than on prolonged observation of the disease and its treatment, that they produce a treatment which is really a perversion of one of the greatest therapeutic blessings which we possess. While, therefore, mercury is by all odds the great and reliable remedy against syphilis, its dose must not be too much attenuated. On the other hand, it must not be administered with too lavish a hand, but carefully, guardedly, with full and repeated observation of the patient's general condition, and with a watchful care as to how the lesions are affected by its use. In short, the treatment of syphilis means on the part of the physician a full knowledge of the disease, a consideration of the patient's strength or weakness, a close familiarity with his lesions and with the workings of the syphilitic virus in his system, and an accurate knowledge, based upon frequent observation and interrogation, of the manner in which the remedial agent affects his system and the general morbid condition. In other words, the physician has not the abstract problem—syphilis—to treat, but he has a human being infected with a chronic multiform disease as the subject of his study, and for whose relief and cure he must familiarize himself with his constitution and watch and guide the effect of his therapeutic agents.

As an adjuvant to mercury in the main, and rather exceptionally as the mainstay of syphilitic medication, we also have iodide of potassium and also of sodium. These agents play a very important part in syphilitic therapeutics, and fully claim second place to mercury.

Then, also, we have as adjuvants all kinds and modes of hygienic

and careful regimen; and we invoke to our aid all the most efficient tonics and hæmatics. Let us now consider some of the principal methods of treating syphilis in vogue at the present day.

EXPECTANT TREATMENT.—The expectant treatment is the outcome of the theoretical cogitations of Diday, and is advocated mainly by himself and the younger Zeissl, who inherited this therapeutic heirloom from his father, who was also given to Diday's way of thinking. It is an easy-going, happy-go-lucky system of therapeutics, which is fraught with uncertainty, danger, and disaster to the unhappy person who is subjected to it. As a piece of sophistry these therapeutic lucubrations of Diday charm us by their bright diction and their brilliant but untenable assumptions. The only points worthy of mention in this treatment are—first, that it carries with it injunctions to begin treatment, as a rule, at the commencement of the secondary period; and, second, that all cases have their own peculiar form of this disease, and that they must be watched as to the character, extent, and portentousness of their manifestations from early until late. The latter injunction is to my mind the only part of Diday's writing upon this subject worthy of remembrance. Diday claims, for the reason that a small percentage of cases seem to end in the secondary stage, that syphilis is a self-limited disease, with a constant tendency to expend itself, or, as we may say, run itself out. He divides syphilis mainly into two varieties—the mild and the severe—for each of which he gives mercury only temporarily according to various figurative data. He calls his system also the opportunistic treatment, and bases it upon the assumption that Nature makes an effort to rid itself of syphilis. He very rightly emphasizes the importance of careful hygiene and regimen during the course of syphilis. He denies *in toto* any preventive action of mercury, particularly in the secondary period, and claims that in many mild cases tonics and hygiene will cure the disease. He singularly fails to emphasize the fact we so often notice, that a very mild early syphilis very often leads to disaster and death. Succinctly stated, Diday's opportunistic treatment consists in giving mercury or iodide of potassium when syphilitic symptoms show themselves, and when these have disappeared to wait again for another outburst. He is emphatic in his disbelief that mercury has any preventive or curative action in the intervals of repose or latency. Though I think that Diday's doctrine of therapeutics is false, sophistical, and dangerous, it is none the less a part of the history of syphilis; therefore I give it here for what it is worth, as it may appeal favorably to some minds. Not only do his therapeutic assertions hinge very often on false clinical foundations, but his deductions are very often based upon pure hypotheses and assumptions. I will quote liberally from his most recent utterances.

Diday[1] accepts the microbian origin of syphilis, chiefly on analogical grounds, for he concedes that the microbe has not at all been clearly demonstrated. A microbe being of vegetable origin, he ingeniously argues that when, as a pathological factor, it is deposited in the human tissues, it runs its course according to the law of vegetable life, in which are observed alternating periods of activity and of repose. He thus continues: "Now, the first attribute common to bodies of this order (for it is the condition of their development) consists in the two phases which alternately succeed each other: the one of repose—*latent life;* the other of activity—*manifest life.* Now, this is the character of syphilis, which from its commencement to its end is marked by a series of sleepings and wakings; that is to say, intermissions, then resumptions of manifest life; and resumptions to which medical language has justly given the name of *manifestations.* These manifestations in every plant mark the period in which it borrows from the surrounding media the elements necessary to its growth. It is therefore during this state, and it is only during this state, that there are established admissible exchanges between the media and the plant. Consequently, the media can act favorably or unfavorably upon the plant. The evolution of syphilis is strikingly intermittent. Does not this character, which is its distinctive sign, indicate a state equally intermittent in the vitality of the vegetable organism presumed to be its cause? This demonstrated, the law applies itself most naturally to our pathogenic microphytes. Our organism is the habitat of these parasites, their feeding-ground, their field of battle and of strife against the defensive forces of our living tissues." He then goes on to say that if these organisms overwhelm us, we must try to exterminate them. "If we wish that our tissues (terrain) shall cause their death, we must prepare them to that end the moment they show signs of life. Since we cannot by means of the soil (living tissues) attack the microbe, we must wait until it begins to increase and multiply. It is a benefit of nature that at the time when the microbe becomes pathogenic it is particularly accessible to our means of attack. The principle of this therapeutic system consists in waiting in the employment of specifics until the evidence of manifestations, and after a study of their clinical physiognomy we can first seize the moment when the pathogenic agent awakes and is at the minimum of its resistance; and second settle in our minds the nature, the doses, and the duration of the medication necessary to oppose it." Lancereaux laconically sums up Diday's system as follows: "When there is a lesion, intervention; in the intervals, expectation."

It may be remarked that it seems almost foolhardy for a man to base a system of therapeutics upon a simple hypothesis, and yet this is

[1] *La Pratique des Maladies vénériennes,* Paris, 1890, p. 380, *et seq.*

what Diday has done, supporting it with far-fetched analogy and a pure and simple assumption of the behavior of the various syphilitic processes. What evidence have we that the cells of syphilis behave in the tissues of man as do the seeds of the vegetables in the fields? The one process is pathological, the other normal, the latter depending very much for its development upon cyclical changes of time and season, the former upon the various unknown conditions of the disease and numerous complex conditions of the human system.

If any one wishes to get a good idea of the expectant or opportunistic system of treating syphilis, let him study the disease in dispensaries, clinics, and hospitals. Patients who are treated in these institutions as a rule do not apply until more or less urgent manifestations and symptoms begin to trouble them. In general, they merely get patched up, for they only remain as long as their immediate trouble is present and urgent. Then off they go, to return later on with new and perhaps worse manifestations, no medicine having been taken in the mean time. Then, again, let any man who sees in his practice many cases of syphilis watch those who follow treatment regularly and carefully, and compare their condition with that of patients who are careless and only apply for relief in times of urgency, and he will find that the *laisser-aller* cases are the ones which as a rule do badly. However, let me allow the younger Zeissl [1] to speak for himself, and he but voices the tenets of his deceased father. In his most recent paper he says: "When syphilis is treated expectantly—that is, when an antisyphilitic remedy is not given to the patient after the first secondary symptoms—the eruption requires, on an average, a period of two to eight months for its disappearance, while the initial sclerosis requires at least four months, oftener five or more, for its involution. Defluvium capillorum and enlargement of the ganglia often remained noticeable for a year; with the return of the growth of the hair the symptoms successively disappeared. Zeissl (senior) very rarely observed any relapses, especially of a severe kind, when purely expectant treatment was continued until complete disappearance of the syphilitic symptoms. We can confirm the observation from our own experience." He further states that if patients in private practice demanded rapid relief from disfiguring cutaneous affections, mercury was given to them. It seems to me that to pursue a system like the one thus called opportunistic, which can but expose the patient to trouble, danger, and disaster, is almost criminal. It has always seemed to me that this treatment, based on fantasies and assumptions, is founded upon a hopeless view of the possibility of curing syphilis, and upon a fear that the active use of mercury will be productive of

[1] "Die Gegenwärtige Stand der Syphilis-therapie," *Klin. Zeit und Streitfragen*, 1887, p. 160.

harm. I can well understand why the elder Zeissl (as it is reported) recklessly said that if a man once had syphilis, his ghost would be syphilitic. His idea of syphilitic therapy would certainly warrant that belief. The expectant or opportunistic system of treatment is utterly unscientific and perniciously dangerous, and it is well for humanity that it is growing into disfavor, disrepute, and disuse.

CONTINUOUS OR "TONIC" TREATMENT.—The continuous or so-called tonic treatment of syphilis is in reality only a modification of Fournier's system of treatment, amplified by considerable theoretical elaboration. It has had as its champion, in England, Mr. Jonathan Hutchinson,[1] who may be said to be the pioneer in the doctrine of long-continued mercurialization in syphilis. In this country my friend Dr. Keyes[2] has long been a believer in its efficacy, and he is the sponsor for a system of medication which he terms "the tonic treatment of syphilis." The therapeutical agent employed in this scheme of treatment is the protoiodide of mercury (Hutchinson uses gray powder), which is to be given without cessation for two or more years. Here is the system in the author's words: "Supposing that the centigramme granule (protoiodide of mercury gr. $\frac{1}{6}$) has been selected as the medicine to be used, the instructions to the patient are as follows: Take one granule immediately after each meal (*i. e.* three times a day) during three days. On the fourth day add one granule to the midday dose, taking one in the morning, two at noon, one at night. Continue this during three days. Again, on the fourth day add one granule—two in the morning and at noon, and one at night. Continue this for three days, and again on the fourth add a granule. Continue in this manner, being very careful as to food, drink, exposure, etc., until there is very positive evidence of irritation in the intestine, such as colicky pains with positive diarrhœa, or until the gums begin to show signs of being slightly touched.

"The daily amount now taken is known to be the patient's dose of the given preparation of mercury, beyond which he cannot go without aid from opiates, and of which, if long maintained, the effect upon the general health will be certainly damaging.

"The amount, whatever it may be, I call the full dose in contradistinction to his 'tonic dose.'

"It is impossible to find what the full dose of a patient is except by experiment. The 'full dose' being ascertained, it may be continued by the aid of opiates and unirritating food until the eruption or the syphilitic symptoms, whatever they may be, are overcome. As soon, then, as the active symptoms have yielded, the patient's dose is

[1] "When and How to Use Mercury in Syphilis," address before the Hunterian Society of London, January 8, 1874.

[2] *The Tonic Treatment of Syphilis*, New York, 1877.

reduced one-half, and this half dose, which will act as a tonic (I call it the 'tonic dose'), is to be continued unceasingly day after day, month after month, waiting for new symptoms. Should such symptoms appear (there may be none whatever except throat and mouth lesions), the half dose held in reserve (I call it the 'reserve dose') may be at once added to the 'tonic dose,' and the 'full dose' continued until the symptoms yield, after which the 'tonic dose' is to be again resumed."

I have never been an advocate of this scheme of treating syphilis. It has always appeared to me that the system is very thoroughly pervaded with theory and built upon confusing arithmetical problems. It assumes to gauge the therapeutic power of mercury by the state of the gums and of the intestines of patients taking the drug for syphilis. I do not consider these buccal or intestinal criteria of such importance or of such reliability that they should be the guiding-points in medicinal treatment. In most cases salivation can be prevented by scrupulous care of the mouth, and the patient put in such a condition that he can stand large doses of mercury, whereas while he had his buccal infirmity he suffered from sore mouth from very minute doses. So that, as a broad general rule, it may be said that the state of the mouth is not an index as to the amount of mercury the patient can take or as to its therapeutic effect on the disease. Moreover, the condition of the intestines is not in any sense a reliable guide in syphilis therapy. The mercurial taken by the stomach may cause mild or severe gastro-enteritis and have no effect upon the syphilis, and the believer in this doctrine might then think that he was at the end of his tether—that he had gauged the patient's dose and found it irritating and inefficacious. Now, let that man leave the patient's stomach alone, and administer to him hypodermic injections of mercurials or inunctions of mercurial ointment, and he will generally find that with careful management the symptoms and lesions will be made to yield without untoward effects, though he may be a little wavering in his mind as to the arithmetical quantity of mercury he has given that patient. In this case certainly the intestines are not good guides.

Then, again, a man who pins his faith on one remedy and one form of pill in the treatment of syphilis is like a man who attempts to run with a chain and ball attached to his leg. The treatment of syphilis is far from being a matter of routine or a mere problem of dose-arithmetic. To be thorough and successful, as I have said before, it must be based on broad principles, upon an accurate and full knowledge of the disease, and upon frequent and thorough study and observation of the patient. In the course of syphilis many conditions, exigencies, and complications are apt to arise, and the physician to be successful in its cure must be ready with all known modifications and expedients of

treatment. I would ask what latitude a surgeon has in the treatment of syphilis with only protoiodide-of-mercury granules, pellets, or pills at his command? In what condition is he to cope with unusual features, exigencies, or complications?

Furthermore, the fatal shortcoming of this treatment resides in the mercurial preparation itself. Though much vaunted years ago in the therapeutics of syphilis, the protoiodide of mercury has, after years of trial by many syphilographers, been found to have only a certain scope and very many limitations. It is a very excellent preparation within certain limits, but beyond them it is feeble or even inert. I have used this remedy for more than twenty years, and to-day, after careful study and observation, I am led to place little value upon its efficacy in the treatment of syphilis after the lapse of the first few months. In early secondary syphilis it may be used with decided benefit, but later on in the vast majority of cases it will be found wanting, and can be replaced with benefit by other mercurial compounds taken by the mouth or by other methods of administering mercury.

Finally, the unremitting use of the drug has its disadvantages, its drawbacks, and its dangers. We find some patients who, having a mild form of syphilis, keep on taking the protoiodide for long periods for the reason that it is easily taken. Some people can take mercury for years, and seemingly be unaffected injuriously. The drug seems to stimulate their portal system, and takes the place of saline laxatives. I very much doubt whether the mercury in many of these cases is at all absorbed into the circulation. The continuous use of mercury by stomach ingestion induces a condition of tolerance, and after a time it ceases to be a therapeutic agent, or has no effect—certainly none that is beneficial. For many years I have seen patients who have come of their own accord, or have been sent by physicians, who have been treated continuously and without any intermission whatever for two or more years with mercury, and who still have some syphilitic lesion which refuses to disappear—perhaps dermal, osseous, or articular, or even cerebro-spinal, ocular, or visceral. These patients, and very often their physicians, cannot understand why it is that a treatment so constant and seemingly energetic, and in most cases so conscientiously administered, should be productive of such unsatisfactory results.

The answer is clear and simple. They have used mercury in a weak and impotent manner in the early days of syphilis, and have continued its use long after it had ceased to have any therapeutic effect—long after it had lost its influence, when given by stomach ingestion, over the syphilitic diathesis. Strange to say, some of these patients had escaped without serious injury, but in others the chances of cure had been materially jeopardized or rendered more remote. In very many cases this incessant mercurial treatment is productive of

very bad results. I have seen most distressing instances of neurasthenia and a general undermining of the constitution, which predisposed the patient to such grave disorders as pneumonia, phthisis, erysipelas, etc., which were undoubtedly due to the debilitating influences of a long-continued mercurial treatment, which greatly defibrinizes the blood and weakens the tissues. Dilatation of the stomach (Jullien) and a low grade, or even a severe and ulcerative form, of enteritis, have (Overbeck, Heilbronn, and Mehring) been known to be caused by these continuous mercurial courses. Thus given, mercury does not cure the syphilis, which may slumber or may break forth, but it induces a low grade of health, which is fraught with trouble, danger, and disaster to the patient. I scarcely know of a more difficult task than that of curing an old syphilitic who presents more or less distressing or dangerous lesions for which he has long undergone an attenuated, low grade, and prolonged mercurial medication, which kept him on the ragged edge, and failed to dislodge his enemy. I have seen, during many years of careful observation, so much trouble, suffering, misery, and even disaster, result from this method of treatment that I feel it my duty to raise my voice against it as being unscientific, irrational, and mischievous, and a perversion of one of the greatest therapeutic blessings which we possess. It is gratifying to note that among advanced syphilographers there are very few indeed who advocate chronic continuous mercurialization. This fact has been well shown in all of the discussions at the recent great congresses of Medicine and Surgery.

The Interrupted Treatment of Syphilis.

The method of successive treatments or the interrupted treatment of syphilis was proposed by Fournier[1] in 1872, and was the outcome of a reaction against the short and vigorous six months' mercury and three months' iodide of potassium treatment which had been introduced by Ricord, which with certain minor modifications was followed by most French surgeons of those times, though some of them were contented with a three months' course. Fournier says: "I am fully satisfied of the truth expressed by Chomel, that the duration of the treatment is more important than large doses. It is a hundred times better to treat a patient for a long time with sufficient doses of mercury than within a short time to give him large doses. This point, however, is scarcely open to dispute, for it is certain that in order to derive all the good which mercury can give, and to avail ourselves of its *curative* influence *for the future*, it is necessary to administer it for a longer time than is generally laid down." Fournier recognized that when given over long

[1] *Leçons cliniques sur la Syphilis, etudiée plus particulierment chez la femme*, Paris, 1881, p. 782, *et seq.*

periods mercury loses its efficacy, and says: "It is the same with mercury as with other remedies: its continuous use induces a condition of tolerance which lessens and finally destroys its therapeutical effect. Now, what interpretation more simple or rational can be given to the fact, which every observer has seen many times, than that a certain dose of mercury, having exerted an influence on the disease for a certain time, beyond that has lost its influence because the organism has become *habituated to it?*" He therefore advised, in 1872, that over a period of two years mercury should be given for a time, and that then it should be stopped for a certain time, during which the patient becomes unaccustomed to the remedy. By so doing, he says, "I should preserve the peculiar intensity of action of the mercury during the whole period of treatment."

He then continues: "The second intention of this method is to confer upon patients the advantages of a long-continued treatment, and this method is better adapted than any other to this essential indication. In fact, it enables patients to be treated for a long time without wearying them, and to take for as long a period as may be necessary a remedy which, if continuously administered, would not be long either in being not tolerated or in losing its curative action."

Before giving a brief outline of the main points of Fournier's system of mercurialization in syphilis I feel that I shall be doing much good service, particularly to the younger members of the profession, by quoting in full Fournier's graphic, eloquent, and in every way admirable exordium as to the necessity of treating syphilis (which, by the way, is one of the most trenchant passages in syphilographical literature), for the reason that some may be led astray by the specious, sophistical, and pernicious doctrines of the opportunist or expectant school. He says: "Is it or is it not necessary to treat a syphilitic patient? Is it or is it not beneficial that he should be treated? In order to answer a proposition thus stated, let us consider what risks such a patient runs, by stating his condition clearly. To what dangers, in fact, is he exposed? Let us set forth his pathological balance-sheet, if I may speak thus—a balance-sheet which if not certain and inevitable is at least probable and possible. What can such a patient have? What lesions is he liable to develop some day or other? And these lesions, are they of such a character that it will be urgent or advantageous that they should be treated? What he can have are at first lesions without any real gravity, but which are at least very disagreeable to some, particularly if they are visible: thus he may have cutaneous syphilides of various forms, very annoying syphilides of the mucous membranes, engorgements of the ganglia, alopecia, and onyxis. In the second place, there are more serious lesions, from the fact that some of them are very painful: they are angina, cephalalgia, various

pains with nocturnal exacerbations, insomnia, myalgia, pain in the joints, inflammation of tendons, periostitis, etc. Should not the possible anticipation of such troubles justify the intervention of treatment? But we have really a third order of lesions, which are much more serious, and which may involve and compromise important organs. Only to cite the most common of this group, we shall find affections of the eye, such as iritis, choroiditis, and retinitis, which are capable of impairing or even extinguishing vision; sarcocele, which may induce disorganization and atrophy of one or both testicles, and thus produce impotence; gummy tumors, which often perforate and destroy the velum palati and leave a double and revolting infirmity; paralyses of the eye and face; hemiplegia and paraplegia; inflammation of bone, caries, ozæna, flattening and loss of the nose, without speaking of the possibility of hereditary transmission and of the introduction of syphilis into the family circle. But this is not yet all. If we consult a manual of pathological anatomy we shall find there described fatal lesions attributable to syphilis alone. The causes of death in syphilis are many and varied: death by hepatic lesions, cirrhosis, and hepatitis gummosa; death by lesions of the meninges; by cerebral gummata and syphilitic encephalitis; by lesions of the spinal cord, which are more common than is generally believed; by exostoses of the cranium and vertebræ; by lesions of the kidneys, of the larynx, and of the lungs, and more rarely by lesions of the œsophagus and rectum; death by consumption and progressive cachexia. These are, in short, the possible consequences of syphilis, and such is the perspective offered to a person who contracts this contagion. Dare we call a disease benign which can end thus? Can a disease be called benign which is fraught with such serious accidents and whose pathological anatomy is so rich and varied? Dare we tell persons afflicted with this disease to leave it untreated, to let things go, and to wait patiently the possible results of such an infection, without warning them of it?"

Certainly nothing further need be said as to the duty of the physician in the treatment of syphilis.

Fournier's method of treatment, concisely stated, is as follows: He begins by administering from three-quarters to one and a half grains of the protoiodide daily in divided doses. In three or four weeks the eruption will in all probability have disappeared. The treatment, however, is prolonged for two months. (That is, the patient is put under treatment in the primary stage and mercury is given for eight weeks.) Fournier then says: "After that, what shall I do? After that, *whatever may happen* (bear this well in mind), I would suspend treatment, being very certain from experience that my patient will have already become accustomed to the mercury, of which continued doses would only have a relatively small effect. I would leave him without treatment for

several weeks; to be more definite, at least a month. That time having elapsed (understand this well also), I would recommence the treatment, whatever might have happened; whether the patient has or has not had new lesions, he would be none the less syphilitic nor less liable to the manifestations which it is my desire to prevent." The renewed treatment should last six weeks or two months, and then a respite of three months is granted. Then mercury is given again for six, seven, or eight weeks. Then a suspension of several months, until at the end of two years a patient has taken mercury for ten months, and has at intervals been without it for fourteen months. This treatment, introduced in 1872, has been adopted by many, and has been attacked violently by a few, notably by Diday, against whose therapeutics Fournier directed much incisive logic and many facts. It evidently has not fulfilled the expectation of its originator, for we find that within a few years Fournier[1] writes: "Syphilis is an infectious chronic constitutional disease, diathetic like gout and scrofula, and should have a lifelong treatment." So in 1889 he says that in the third year there should be four courses of six weeks each with respites of equal length, and that iodide of potassium should be taken. In the fourth year four similar courses of six weeks' duration, and in the fifth year three courses. We also find that Martineau advocated a five years' course, while Besnier says that it should be indefinite, and Leloir has recently put forward a system of treatment of four or five years' duration. Indeed, there seems to be in France a prevailing belief among many that syphilis is an incurable disease, such a statement being the keynote to a series of clinical lectures by Denis-Dumont, published in 1880.[2]

For many years I was an advocate of the plan proposed by Fournier for the treatment of syphilis, and I had the pleasure of first presenting his views in the English tongue.[3] But as years went on I found that although the general plan is an excellent one, the treatment as a whole is very defective. The objections to it are mainly those which I have detailed in the section on the continuous treatment by mercury, which is really only Fournier's treatment kept up without cessation, and is even more defective and inefficacious than the latter.

As a general working plan, however, Fournier's system has much to commend it, though I am free to say that I can only condemn its essential feature—the protoiodide of mercury as the therapeutic *piéce de resistance* and the general arrangement of treatment in the primary and early secondary stages. For very many years I have studied this

[1] "Direction générale du Traitement de la Syphilis," *Gazette des Hôpitaux*, Nos. 103 and 107, 1889.

[2] *De la Syphilis: unité d'origine; incurabilité; traitement*, Paris, 1880.

[3] "On the Treatment of Syphilis," by Alfred Fournier, M, D., translated by R. W. Taylor, M. D., *New York Med. Journal*, Aug. and Sept., 1872.

question carefully, closely, and conscientiously, having at my command a vast clinical field; and in the light of knowledge already gained, and of what I learned from my successes and my failures, I have arrived at conclusions which embody, I venture to think, a most effective and practical system of treating syphilis—one which in the great majority of cases will eradicate or suppress the disease and restore its victim to health. In this treatment there is nothing particularly new and startling, and in its essential points I have the support of many of the ablest continental authorities. My observation from year to year has thoroughly convinced me that the current emasculated, theoretical systems of treating syphilis are dire failures and bring very many patients to discomfort, suffering, disaster, invalidism, and death. While some may get through by reason of some lucky chance, I feel very certain (and I make this statement after due thought and observation) that a man in the long run will have a far better chance to be cured of his syphilis by the old-time vigorous six-months' mercury and three-months' iodide treatment than he will by the long-spun-out, attenuated courses which have as a watchword the phrase pregnant with ignorance and complaisant indifference, that time and mercury will cure or wear out syphilis.

The General Methodical Treatment of Syphilis.

We have already seen that, for very cogent reasons, it is best to wait until the onset of the secondary period before beginning a general antisyphilitic treatment. If the patient is under observation during the course of the chancre, much can be done for him in advance by the surgeon. At this time he can be prepared, if necessary, for the coming ordeal by a preparatory tonic course, or if there are indications of gastro-intestinal impairment or debility, measures to remedy them may be instituted. Then, again, in this period, if there are very much swollen lymphatics or ganglia (and they will be found in association with the chancre), a well-directed external regional treatment may be followed. To this end mercurial plasters, such as emplastrum de Vigo, or Unna's and Quinquaud's plasters, or simple mercurial ointment, may be used. This regional treatment will have no perceptible effect upon the general deepening of the infection. At this time also the condition of the mouth, gums, teeth, and pharynx should be inquired into, and these parts should be put as nearly as possible into a condition of health.

Before putting a patient upon general antisyphilitic treatment it is well for the physician to place before him certain facts as to his condition and his duties, and to forecast for him, as far as possible or prudent, his future pathological balance-sheet, so that he may know clearly what he has to do, what he has to fear, and what he may expect. With

the onset of secondary syphilis a most important and eventful epoch in the life of the patient begins, and much can be done for him by a little kindliness and common sense. The physician must impress upon the patient the fact of the gravity of his disease and prepare him for the ordeal which is in store for him. He must be made to understand, in a gentle, kindly manner, that the ensuing two years at least are the most critically momentous ones in his whole life, and that his future health and happiness and those of his family depend upon his care of himself during this trying epoch. It is cruel and unnecessary to paint a dismal and lugubrious picture to these patients, or by word or manner to depress or discourage them. We are in the position, thanks to our advanced therapeutics, to speak encouragingly and even brightly of their future, and to hold out to them the assurance that the ordeal of treatment will not be irksome or painful, and that a future cure is in store for them. We can tell our patients truthfully that two or two and a half years of careful, methodical, watchful treatment are, if they will conform to its regulations, sufficient to cure them of their disease. As a result of the treatment they will see the syphilitic lesions cease and fail to return, they will enter into a period of health in which there are no signs whatever of syphilis about them, and they will thus remain and will possess the power of procreating healthy children. The requirements for this gratifying state and for this future immunity are a fairly good state of health previous to infection, the docility and loyalty of the patient to his physician, and a treatment begun sufficiently early and carried out in a watchful, thorough manner. This is the tripod upon which his future happiness rests. In the treatment of syphilis the duties of the physician and patient are reciprocal. While, therefore, in the majority of cases, particularly those of the intelligent and well-to-do classes, we are warranted in giving a hopeful and satisfactory prognosis, there are cases in which, under the best of circumstances, the progress toward cure is slow, often disappointing and halting, and attended with much suffering, discomfort, debility, and illness. But even in these cases, trying and often discouraging alike to the patient and the physician, there is usually no necessity for doubt or despair, since with the rich therapeutic armamentarium at our command we are enabled to adapt ourselves to urgent necessities, exigencies, and emergencies, and even to cope with formidable crises. In his early interviews with a syphilitic patient it is the duty of the physician to make a careful study of the man, to acquaint himself with his temperament, his standard of health and vitality, his greater or less power of resistance to disease and bodily strain—in fact, his mental and physical stamina, modes of life, tendencies, habits, surroundings, and his duties, obligations, cares, and responsibilities—since from such a study much valuable knowledge is gained.

It must always be remembered that weakly, cachectic persons of poor fibre; flabby subjects; those who may be classed generally as under-weight individuals; persons of very light and sandy complexion; those suffering from rheumatic, gouty, tuberculous, neurotic, malarious, or other adynamic conditions or influences; those having visceral disease of any kind or any inherited or acquired morbid tendency, and particularly persons addicted to alcoholic indulgences,—are liable to suffer more or less severely from syphilis, and that in such cases the prognosis is less favorable and a longer time for cure may be required.

Besides its lesions proper, syphilis tends in many cases to produce in the economy anæmia, cachexia, and even a condition of marasmus. Though there are some patients in whom it does not produce debility, and who, despite their disease, seem as well as they ever were, we must always be on the lookout for its depressing effects upon the system. Therefore the first rule to be laid down in the treatment of syphilis is that the hygiene, regimen, and surroundings of the patient shall be made as nearly as possible perfect. The diet must be simple, ample, and nourishing, and the patient's habits as to eating, drinking, and sleeping should be regular and systematic. All health-giving sources of recreation and exercise should be made use of, and every attention should be given to maintaining the health and vitality of the patient at as high a plane as possible. Therefore patients must be warned against overtaxing themselves physically or mentally, or in any way putting themselves on a strain. The physician should always be watchful, particularly in the treatment of patients of the higher classes, about the mental wear and tear that so many are liable to. In such cases syphilis is very prone to produce cerebral and mental disturbances.

While in general abstinence from alcoholic drinks is to be recommended for syphilitic patients, it is always well to exercise wholesome common sense in dealing with this question. Many authors go to an extreme in considering that syphilitics should become prohibitionists. The ordeal of the syphilitic is not as a rule a very happy one, and the less we surround him with irritating restrictions the more docile will he be in the long run in following treatment. Therefore I think that a man who by habit partakes moderately of claret or burgundy or other mild stimulant at his chief meal, and who enjoys it and is seemingly none the worse for it, should not generally be deprived of it. Then, again, there are patients who partake in moderation of ale and beer, and who are to their thinking benefited thereby. Provided these stimulants do not disorder the stomach, they can hardly be called deleterious; therefore their use should not be abruptly interdicted. On the other hand, indulgence in strong alcoholic drinks and champagnes must be peremptorily stopped. Nothing is more galling to patients, according to my experience, than a tread-

mill treatment which surrounds them with all sorts of restrictions and imposes upon them blue-law abstinence. The plan which works best in the long run in handling syphilitics is that which, compatible with their well-being, gives them most latitude and revolutionizes their habits and modes of life as little as possible. To sum up, alcohol should only be used by syphilitic patients in great moderation and under conditions which tend to improve their strength and digestion.

It is almost unnecessary to say that excessive sexual indulgences are depressing and exhausting, and that they are to be wholly avoided. Very many cases of cerebral and nervous syphilis have their origin in sexual excess, and many men have become infirm or have perished from such over-indulgence while in the power of syphilis. As to tobacco, we can hardly speak with the same latitude and tolerance as we can of alcoholics in syphilis. Smoking and chewing, even in mild indulgence, are so prone to induce irritation and inflammation of the mouth and throat, parts which it is so vitally necessary to keep in a high state of health, that we are forced as a rule absolutely to prohibit them. It requires, very often, considerable moral courage to deny the touching appeal of a patient to be allowed one or two cigars a day, but we must in general stand firm. Still, there are cases, happily for them, in which, despite syphilis and its treatment, irritation of the mouth and throat does not exist, and such patients may perhaps, under observation, indulge their favorite habit. Wherever the use of tobacco produces even mild hyperæmia of the mouth and throat it should be firmly forbidden.

All functional derangements or affections of internal organs, stomach, intestines, liver, spleen, kidneys, etc., should be carefully attended to. Patients prone to pulmonary affections, and those having a tendency to rheumatism and gout, should be warned in advance to observe very great care in the avoidance of the causes which are liable to light up or develop these dormant tendencies. In like manner, neuropathic subjects, and those suffering from any hereditary or acquired cerebral or nervous trouble, should be made carefully but impressively to understand that the nervous system is their weak part, and that while they are in the grip of syphilis they must be more than ordinarily careful not to overtax it or to abuse it.

It is very important that the changes of the season and weather should be accompanied with appropriate clothing, and that the utmost precaution should be taken against catching cold.

While the physician should thus impress his patient with the gravity of his condition, he should also constantly hold out to him that most consoling hope, that he will, in all probability, in the end be free from his disease. While some patients are calm and sensible, and others

light-hearted and indifferent to their physical condition, others, again —happily not many—show a tendency to worry, fret, and solicitude, or even to a depression of spirits and melancholy which is termed syphilophobia—a most distressing state of mind both for the patient and his physician. Such cases should be treated with constant encouragement and kindness mingled with firmness; their doubts should be dispelled, their fears should be allayed, and bright hopes should be held out to them. By such a course many a rough spot will be made smooth, and many a man will be auspiciously brought through his syphilis who otherwise would have faltered or have fallen by the wayside.

With the onset of the generalized manifestations of syphilis at the beginning of the secondary period the regular methodical treatment should be commenced. At this time and at short intervals thereafter the patient must be carefully examined as to the condition of his skin and its appendages, of his mouth and throat, and lymphatic system generally. Taking for an example a case of roseola with its usual concomitants of slight fever, malaise, and perhaps nocturnal headaches or rheumatoid pains, we should immediately put the patient, as a general rule, upon treatment by the mouth. Later on the inunction method may be employed, but as a rule pills are quite effective, particularly in the very early secondary stage. While intelligent patients will usually submit gracefully to inunction treatment later on, its adoption at the very outset is apt to be irksome, and to give them the idea that they have a very trying and unpleasant ordeal before them. Though many preparations of mercury are employed, my preference is for the protoiodide and the tannate when the drug is given in pill-form. Calomel and blue pill are usually not satisfactory agents. Calomel is very apt to salivate promptly, and its action is far from certain; and as to blue pill, it may be said that when given in small doses it does nothing for syphilis, though it may act upon the liver, and when it is given in sufficient quantity one never knows how soon severe salivation may be induced. Bichloride of mercury is given by some physicians in pill-form, and is the active ingredient in the Dupuytren pills so much used in France, but it is very apt to produce pain in the chest and bowels and gastro-intestinal irritation. Then, again, its action cannot be relied upon, for in small doses by the stomach it does little if any good, and in large doses it is very irritating. Its action when used hypodermically is, however, very efficient and satisfactory, and its local action in lotions and ointments is very prompt and beneficial. Within recent years the carbolate, salicylate, thymolate, alanilate, and other preparations of mercury have been vaunted as possessing marked potentiality, but when put to the test they give evidence of possessing no advantage over the drugs I have named. In

the section of this essay upon hypodermic injections all the new compounds are treated of.

Since every case of syphilis is a law unto itself as to the amount of mercury which will be required for its cure, we can only state the doses approximately. For an adult, male or female, a quarter or a third of a grain of the protoiodide of mercury may be given at a dose, of which three a day will be sufficient. Very large and robust persons may require one half of a grain at a dose. These are always good doses to begin with, and by them the tolerance of the drug may be gauged and its remedial action estimated. I have elsewhere in this essay called attention to the very minute doses of the drug given by some physicians, but it is appropriate to repeat here that the one-fifths and one-sixths of a grain of the mercurial preparation recommended by some are merely child's play for most cases of syphilis.

In the early secondary stage there are certain conditions favorable to an active treatment—namely, a system virgin to mercurial action and a greater susceptibility of the lesions to the action of mercury. This, then, is the most favorable time for efficient treatment, and it is the most critical one in the life of the syphilitic, for if the disease is actively attacked then, its backbone may be broken. It is very probable that much of the late rebelliousness and malignity of syphilis is due to the fact that the newly-formed infecting granulation-cells and the concomitant subacute inflammation induce in organs and tissues, particularly delicate ones, structural and nutritive changes which predispose them to subsequent low grades of inflammation and cell-increase; besides, to a repetition of the essential syphilitic process. Therefore every effort should be made to destroy these young infection-cells, and to remove them as quickly as possible from the parenchyma of organs and tissues, before they shall have had time to induce these subtle and dangerous structural changes. In proportion as a systematic and vigorous mercurial course is entered upon late, so it is more and more heavily weighted in its action. There is no doubt whatever in my mind that a mercurial treatment covering the first six months of the disease is far more salutary and effective than a course extending over a year and more, instituted later on.

It is important, therefore, that the initial course should be active and prolonged, and in attaining this end the case must be carefully handled and watched. As a rule, the physician can form a correct estimate as to the probable effect of mercury upon his patient within a week or ten days. Having put the stomach and intestinal canal in normal condition, and the mouth and throat having received proper attention (see section on Stomach Ingestion), the dose of the mercurial may be increased within a few days to one grain or one grain and a half, and even to a larger quantity. It is rarely necessary to give more

than three grains of the protoiodide in a day, and most cases will do well with about two grains, or even less. The tannate of mercury is a very active drug, which from a large experience I have come to place much confidence in. It is not as mild as it has been claimed to be, and cannot (as has been implied) be used with impunity. In some cases it causes gastro-intestinal irritation, and in my early days of its trial I saw several cases of prompt and severe salivation. Its initial dose is best fixed at one half a grain, instead of a grain, as recommended by some. In combination with the mercurial preparation we may employ a ferruginous or bitter tonic, and as an adjuvant we may add a sedative agent to calm the intestinal canal. I think a note of warning should be raised against the combination of preparations of opium in antisyphilitic remedies. There is really no need for them, and much harm may be done by their continued use in producing an habituation to the drug, with all its deleterious effects upon the nervous system, the digestive organs, and the tissues generally. We can never determine the exact condition of a patient under mercurial treatment who is also under the influence of opium. As a general rule, in stomach ingestion mercury, if carefully given, causes little trouble. It may produce diarrhœa and colicky pains for a day or two, which a little essence of ginger or peppermint will relieve, or it may be necessary to omit one or two or more doses. In general, if patients are careful about their food and do not take too much fluid into their stomachs, the mercurial will after the first disturbance cause no irritation.

The following formulæ may be used:

℞. Hydrargyri protoiodidi,	gr. viij to x;
Ferri et quinin. citrat.,	ʒiss;
Ext. hyoscyami,	gr. vj.—M.
Ft. pil. xxx.	

℞. Hydrargyri tannici,	gr. xv to xxx;
Quinin. sulph.,	ʒj;
Ext. hyoscyami,	gr. vj.—M.
Ft. pil. xxx.	

The protoiodide may also be used in the form of tablets, and the tannate is put up in gelatin-coated pills. As I have said elsewhere, the protoiodide of mercury is a rather feeble preparation, and its use is most effective in the early months of syphilis, though in later periods it may be employed if we desire a mild mercurial action. When we administer it in the initial course of treatment we must watch its effects very carefully, otherwise we may waste most valuable time. I am firmly convinced, from ample experience and conversations with physi-

cians, that since the adoption of the long mercurial courses with minute doses an easy-going, happy-go-lucky feeling has taken hold of many of them in the treatment of syphilis. They are told, in some of the books and at some colleges, that with doses of fifths and sixths of a grain of the mercurial salt syphilis may be cured in two or three years, and this, practically, is the extent of their therapeutic armamentarium. This teaching, I know, has engendered a feeling of false confidence and security and a tendency to superficial and dangerous routine. The physician complacently satisfies himself that his arithmetical dose is all right, and he contents himself with the thought that time and mercury will wear out syphilis, and that all will be well in the end. Under these conditions the patient is largely lost sight of, and the abstract problem—syphilis—is uppermost in the physician's mind. The cure of syphilis can only be accomplished by constant care and watchfulness on the part of the physician, who should feel his way, should push his remedy cautiously, and keep it so well in hand that he will get all of its good affects and avoid all drawbacks and harm which may arise if they are not looked out for.

The criteria which indicate that our treatment is correct and efficient should be carefully studied. If the patient looks and feels well, sleeps soundly, eats heartily, holds his accustomed weight, and is mentally and physically in a satisfactory condition, there is strong evidence that he is being benefited. But we must further assure ourselves that the lesions are being acted upon. The indurated nodule must have wholly disappeared, the lymphatic engorgement must show evident signs of involution, and the rash must have faded. The throat and mouth must be inspected very often, and any red patches or ulcerative lesions must be actively treated. It is always a good rule as the rash is declining to discontinue the pills and to give the patient one or two courses of mercurial inunctions (see section on Inunctions), by which the whole surface of the body will be acted upon by mercury. In this way any infectious cells which may be left over from a local or general rash may be acted upon and destroyed. Even while the patient is taking pills mercurial ointment may be used locally upon the lymphatic ganglia, due care being taken that an overdose is not given. In like manner papular and pustular lesions in hairy parts should be treated locally. The physician should always remember that all syphilitic lesions, even the most minute, are to be feared as possible sources of continuous or intermittent reinfection of the system. The morbid cells contained in these lesions are capable of great, even infinite, multiplication, and the so-called syphilitic relapses are due to the recurrence of these cell-proliferations, which develop from morbid foci left over at an earlier date. Painful spots and swellings upon bones or near or at joints, thickening of the fasciæ and subcutaneous con-

nective tissues, should receive regional treatment. In like manner, in cases of headaches, neuralgias, rheumatoid pains of muscles, eye and ear affections, affections of the hairs and nails, the mercurial action should be brought as near as possible to the morbid area. It is also advisable to watch for and act promptly upon red scaling patches and papules seated upon the palms and the soles, since they are very persistent. Any swellings and hyperplasiæ about the mouth or face, vulva, anus, and scrotum should receive careful local treatment. As time passes, in some cases it will be seen that even with full doses internal mercurial medication is feeble and more or less ineffective. If the case is carefully watched this will be promptly discovered, and the patient may be put upon inunctions, fumigations, or hypodermic injections. It is a good rule never to be content with the action of mercurial pills unless we see a decidedly rapid subsidence of the lymphatic ganglia. It must not be forgotten that the action of the protoiodide, the tannate, and other mercurial preparations grows less pronounced as time goes on and the infecting cells become more stable and hardy. This fact being evident, it is necessary to substitute another method of administering mercury.

Our aim should be to keep up a continuous mercurial action during from four to six months after the onset of the secondary stage. In general, this can be done without experiencing any serious drawbacks if the case be properly watched. There may be periods of a few days in which it is necessary to suspend medicine and either leave the stomach at rest or give tonics. But as a rule this early period offers us our golden opportunity, and we should always avail ourselves of the then existing favorable condition of the stomach and the system to assimilate mercury. In somewhat rare cases mercury taken by the stomach acts as a general depressant and the patient's nutrition is impaired. I have many times seen these grave drawbacks and seeming contraindications promptly dispelled by the employment of hypodermic injections of the bichloride of mercury. In such cases it is well to begin with a moderate dose, and then work upward as fast as we can.

During this initial active and energetic course we must take especial care of the patient's nutrition and be watchful of his well-being. If possible, change of air and scene at the seaside or the mountains should be enjoyed and as much recreation indulged in as possible. The lighter the patient's cares and the less burdensome his condition of life, the more auspicious will his progress toward cure be.

While a patient is undergoing this mercurial course he should have one or two warm baths each week on going to bed, in order to produce diaphoresis. When practicable he should take Turkish baths, without the cold plunge, and after them should be made to sweat freely. At

the seaside cold salt-water baths are very beneficial, and an occasional hot sea-water bath, followed by packing and a sweat, is a valuable adjuvant to mercurial treatment.

In cases, particularly uncomplicated ones, well treated from the beginning there are usually no perceptible secondary or tertiary stages. The secondary stage is entered upon, the disease is systematically attacked, and, excepting, perhaps, a few ephemeral and trifling manifestations upon the skin or mucous membrane (and they are largely produced by extraneous irritation, friction, coaptation of parts, want of cleanliness, smoking, etc.), he or she sees no further development. Still, some cases are rebellious, and tax our resources and patience, and some—happily few—go badly from the start.

Early in the secondary period in some cases it is necessary to resort to the use of iodide of potassium, sometimes alone and again in combination with mercury. As a rule, these cases are anomalous ones, in which certain lesions show a tendency to early and precocious development. The early onset of cerebral symptoms, some forms of headache, dementia, mild mania, epilepsy, hemiplegia, paraplegia, and aphasia call for the vigorous use of the iodide in combination with inunction-treatment, which should be used upon the neck and upper part of the body. The early supervention of osseous and articular lesions, the occurrence of epididymitis or orchitis, precocious affections of the ear and eye, and swelling of the spleen and liver should all be combated with a combined iodine and mercurial treatment. In like manner, the precocious development of cutaneous gummata and gummatous infiltration into mucous membranes (particularly of the mouth and pharynx) indicate the necessity of local mercurialization when practicable and the internal use of the iodide of potassium. With these exceptions the use of the iodide is absolutely to be condemned in early and secondary syphilis, for reasons given elsewhere.

It may be stated as a broad general rule that when cases come under treatment after the disease has existed for several months, they should be placed at once upon the inunction method. This course is particularly to be followed when the patient presents a more or less general eruption. In these cases we very often cannot bring sufficient mercury to act upon the surface of the skin through the medium of the blood-circulation, and it is a waste of time and effort to make the patient swallow pills. In all cases in which treatment is begun rather late the physician should be particularly careful to try, as far as possible, to exert a prompt and efficient influence upon the disease, and to keep up the treatment for (as a rule) six months without much interruption. In this way he may be able to make up for lost time, which, I cannot too often repeat, is so vitally valuable.

While in general the initial course of treatment, occupying six

months if possible, should consist mainly of medication by the mouth or by inunction, the physician should be watchful of all complications and developments, should be on the lookout for all drawbacks and dangers, and should be ever prompt and ready with such modifications of treatment, such expedients, and such reserve resources of aid as the case may demand.

Having administered an efficient treatment, with few and short interruptions, for about six months, it is safe to say that in most cases, particularly uncomplicated ones, the patient will be well on his way to recovery. I have very many times seen patients who, for various reasons, had, many years before, undergone but one thorough mercurial course of six months, and who thereafter had been entirely well, had never shown any further evidence of syphilis, and who had procreated perfectly healthy children. Cases like these convinced me of the great efficacy of early thorough treatment, and I am glad to see that several eminent continental authorities have reached the same conclusion. As I have said before (and the repetition is pardonable), a man's chances of being cured of syphilis are, in my judgment, a hundredfold better and surer by means of a single thorough early treatment of six months' duration than they are by the long-spun-out, ready-made, and emasculated method of small and continuous doses.

If the condition of the patient is satisfactory, as shown by the absence of all lesions, by almost entire subsidence of the lymphatic ganglia, by a good condition of his nutrition and strength, and by the absence of symptoms pointing to nervous depression and debility, at the end of six months he may have a rest, the moral effect of which will be very salutary. Patients very often weary of the long-continued dosing, and in the interval of repose they cease to consider themselves sick, and have an opportunity to judge of their condition when they are free from the effect of drugs. Therefore, a month's cessation of medication should be granted, and, if possible, the patient should go to the seaside or the mountains and have an entire change of air and scene. It is not uncommon, however, to see patients who do not desire a period of freedom from medication, but persist in carrying on the treatment.

According to the old-time Ricord plan of treatment, the six-months' mercurialization was followed by a three-months' course of iodide of potassium. Under proper conditions this course may be followed in those cases in which the patients are unusually anxious about themselves, and, as they usually express it, "do not want to lose valuable time." But in general my preference is to begin, after about a month's interval, a systematic inunction course. In cases in which this is impracticable or for any reason contraindicated, I have come to look with much favor and confidence upon a combination of a full dose of mer-

cury with a small dose of the iodide of potassium. The following prescription will illustrate my meaning:

℞.	Hydrarg. biniodidi,	gr. ij to iv;
	Potassii iodidi,	ʒss;
	Tr. cinchonæ comp.,	fʒiiiss;
	Aquæ,	fʒss.—M.

Sig. One tea-spoonful three times a day, an hour after eating, in a wine-glassful of water.

In this combination the mercurial is the efficient agent, and the iodide simply serves the purpose of rendering it soluble. When there is debility the fluid extract of coca may be added to this combination. As shown elsewhere, this agent is a very valuable adjuvant in the treatment of syphilis. From a wide experience I have convinced myself that this combination of mercury and iodide of potassium is particularly efficient and beneficial after the sixth or eighth month of the secondary period, particularly in cases which have been previously subjected to treatment. This combination is usually well borne by the stomach even when the maximum quantity of the biniodide is ordered. But great care must be observed in its administration, and if gastro-intestinal irritation is produced, the dose must be made smaller; and if a depressing effect upon the general nutrition or upon the nervous system is observed, the remedy must for a time be suspended. In these cases rest and change of air and scene are very beneficial.

The second course of treatment may be kept up, with or without slight interruptions, for three or four months, or even longer if the patient shows no signs of deterioration of health referable to the treatment. During this second course inunctions also may be used, with proper spaces of rest, or fumigations may be employed, according to the indications of the case. There may be circumstances present which render a course of hypodermic injections of sublimate preferable. In this way the first year passes, during which the patient will have been under dosage treatment nine or ten months.

Toward the end of the first year, if not before, combinations of mercury with iodide of potassium in quite large doses are very often most beneficial. The use of these combinations is generally known as the "mixed treatment." The following prescriptions are of much value:

℞.	Hydrarg. biniodidi,	gr. j–ij;
	Potassii iodidi,	ʒss–ʒj;
	Syr. aurantii cort.,	fʒiij;
	Aquæ,	fʒj.—M.

Sig. One tea-spoonful three times a day, an hour after eating, in a wine-glassful of water.

℞.	Hydrarg. bichloridi,	gr. j–ij–iij ;
	Potassii iodidi,	℥ss–℥j–℥iss ;
	Tr. cinchonæ comp.,	f℥iiiss ;
	Aquæ,	f℥ss.—M.

To be taken in the same manner as the foregoing.

The combination of the inunction-treatment with iodide of potassium taken internally is often very beneficial indeed, and should be remembered in late secondary and tertiary lesions, particularly when localized to certain regions, which should be acted upon directly by the mercurial ointment. The simultaneous employment of hypodermic injections of a mercurial salt with the ingestion of iodide of potassium is sometimes productive of prompt and marked benefit. As a general rule, the foregoing combinations are very useful toward the end of the first year of syphilis, but in many cases having an unusual course, and chiefly those in which late lesions appear precociously, it may be necessary to resort to them at an earlier date. It is always necessary to watch the condition of the stomach when the mixed treatment is being employed or when large doses of the iodide are administered. As soon as signs of gastric irritation show themselves the remedy must be suspended, and, if necessary, symptomatic treatment should be adopted. The iodide alone or in combination may act as a depressant upon nutrition and upon the nervous system. In these cases it may be necessary to reduce the dose or to intermit the treatment.

Late secondary and tertiary lesions of the skin and mucous membrane, affections of the bones, periosteum, and joints, late-appearing affections of the eye, ear, and cerebro-spinal system, of the viscera, and of the testes and penis, require a combination or mixed treatment. In many cases it is necessary to increase the dose of the iodide far beyond those already mentioned.

It must be remembered that the arbitrary rule laid down by some authors, that early in syphilis mercury is indicated, and that later on the iodide alone should be given, is not, in general, a good one. Many a case of tertiary syphilis has remained unaffected by the use of the iodide alone, and has promptly improved and soon recovered after mercury also was given. The use of mercury, therefore, should not be limited to the secondary stage, but should also be employed in tertiary syphilis, either by inunction or hypodermic injection, combined with the iodide given internally.

It will be generally found that patients who have followed a systematic and thorough course of treatment during the first year very rarely present tertiary lesions. The cases which present these graver disorders are usually those which have been the subject of complications in the secondary stage, or those in which an early efficient treat-

ment has not been followed or has been indifferently followed. Patients presenting tertiary lesions should be actively treated, but at the same time close attention must be paid to their general condition, for in many of them nutrition is impaired and a condition of cachexia exists.

In the carrying out of the methodical general treatment of syphilis in the second year of the disease the periods of dosage may, on an average, be stated at two to three months, with intervals of rest of a month or six weeks. In this way about eight months are occupied by actual medication. In most cases at the end of the second year of thorough treatment patients may be pronounced cured, provided they have not for many months shown evidence of the disease, that their lymphatic system appears healthy, and their general health and nutrition are good. Though there is a disposition on the part of those who rely chiefly on mouth-medication to extend the treatment of syphilis indefinitely, as I have already shown, I see no reason whatever for altering the opinion that I have many times stated, that if an energetic and thorough treatment (such as I have sketched) be followed for two years or two years and a half, the patient will be cured, as shown by the enjoyment of good health, by freedom from all syphilitic manifestations, and by his or her ability to procreate healthy children. In some cases this auspicious result may be the outcome of treatment by pills, but in most it will only be attained by the zealous and intelligent employment of inunctions, supplemented by other methods and by the use of the iodide. In the sections upon Methods of Treatment and upon Special Local and Regional Treatment further information may be found.

There are four classical methods of administering antisyphilitic remedies: first, by the mouth, or stomach ingestion; second, by inunction; third, by fumigation; and fourth, by hypodermic injections. In addition to these specific methods, there are many adjuvant and accessory modes of treatment, which have for their object the general improvement of the economy and the production of a condition in which the antisyphilitic remedies will be better borne and attended with a greater and more salutary potentiality. In the latter categories we may mention baths of various kinds, massage, the hygienic influences of change of scene and climate, and various tonic and stimulant courses of treatment.

Treatment of Syphilis by Means of the Mouth, or Stomach Ingestion.

This method is one very largely, and by some exclusively, used, and it has a quite broad scope, but also many drawbacks and limitations. Antisyphilitic remedies administered by the mouth (and these are composed mainly of mercury and iodide of potassium, used singly or in

combination) consist of pills, granules, tablets, capsules, powders, and of liquid preparations of various kinds.

As we have shown in preceding pages that these two agents possess decided therapeutic effects, we must now consider their drawbacks and the accidental and toxic effects to which they may give rise.

Mercury administered by the mouth may cause gastro-intestinal disturbances and dyspeptic symptoms of various degrees, ptyalism, stomatitis, and salivation, and a general depression and impairment of nutrition. It is well to remember that inunctions and fumigations may also give rise to similar depressing and annoying conditions, and that the hypodermic use of mercurial preparations is also attended with these drawbacks in greater or less degree, according to the particular agent used and the extent to which it is employed.

The most common form of disturbance due to the ingestion of mercury is a mild form of enteritis, which is attended with colicky pains, borborygmus, and diarrhœa. In many cases this condition is very ephemeral and passes away of itself in a few days, during which the system is becoming accustomed to the action of the drug. The pain and disturbance are felt shortly after taking the dose, and last for an hour or more, and then pass off, to follow in like manner the next dose. In other cases the effect is more severe and lasting, and the patient suffers and becomes weak. To remedy and prevent this untoward action of mercury, the utmost care must be exercised in the matter of diet, which should be bland and easily digestible, and in the avoidance of large quantities of fluids and of alcoholic and malt liquors. In very many books the advice is given that the mercurial should be combined with a small but efficient dose of opium, in order to prevent gastro-intestinal intolerance. As a rule, this advice is very reprehensible and liable to be followed by bad consequences. The mercurial treatment must of necessity be long continued, and it is highly improper to combine it with opium, since addiction to that drug is very liable to be produced. Moreover, no system is in a normal state in which opium is given for a considerable length of time. It is well, therefore, if the necessity is urgent, to let the patient have a little paregoric or other mild opium preparation—just enough to ease the pain—which he may take, under great restrictions, as the occasion may require. Commonly only a few doses will be necessary, particularly if extract of hyoscyamus is combined with the mercurial. In many cases chalk mixture or a small quantity of tincture of ginger will be sufficient to help a patient over a rough spot. It must always be remembered that in the greater number of cases the urgent intestinal symptoms are of short duration, and that very soon the digestive tract will tolerate mercury without discomfort to the patient.

In some cases in which pills are taken, but chiefly in those in which

inunctions, fumigations, and hypodermic injections are vigorously given, colitis of different degrees is produced. This condition is attended with much pain and discomfort, and with a diarrhœa which may be so severe as to be bloody. Under these circumstances the specific treatment must be temporarily suspended and the bowel affection treated symptomatically.

Many patients who have taken mercury, even in comparatively small quantities, for a long or even short period, begin to complain of symptoms referable to the stomach. They say that they have flatulence and sour stomach, and that their digestion is slow and attended with eructations and discomfort. In its early days this condition may not be accompanied by bodily weakness, but its continuance is complicated by general debility, pallor of countenance, indisposition to exertion, and even a depression of the nervous system of such marked intensity that we may call it neurasthenia. This condition is also produced by combinations of mercury and iodide of potassium.

The mouth-lesions produced by the use of mercury are certainly less common than those just spoken of. As a rule, most patients bear mercury well; others are at first moderately affected by it; while in a very few cases its use in a short time produces toxic effects of greater or less severity. There is no point deserving of greater emphasis in the treatment of syphilis than that it is most essential to conciliate the mouth. Therefore the physician must examine this cavity in every instance before putting the patient upon treatment. If there are any bad teeth, they must be removed if possible, and if there are any teeth which, being misplaced, rub or press against the tongue, the cheeks, or the lips, they must be taken out or the uneven portion must be filed off. No portion of them should be allowed to produce injurious pressure or friction upon the parts which surround them. Then the condition of the gums must be observed, and any tumefaction, ulceration, or abnormal condition must be cured. The presence of irritating microbes and epithelial débris, which, with the tartar, forms a morbid layer around the teeth and upon the gums, is capable of doing much harm. It is imperative that this condition shall be removed. Hyperæmia or inflammation of the mouth, soft palate, and pharynx often presents very serious obstacles to the continuance of mercurial treatment; therefore these structures must receive careful attention, and local medication should be used for the removal of all abnormalities affecting them. Sigmund,[1] who in his day laid so much stress upon the necessity of a healthy mouth in the treatment of syphilis, also emphasized the fact that abnormal conditions of the nasal mucous membranes often acted as serious drawbacks to antisyphilitic treat-

[1] "Zur örtlichen Behandlung syphilitische Mund Nasen und Rachenaffectionen," *Wien. med. Wochenschrift*, Nos. 32 and 34, June and July, 1870.

ment. My own experience has taught me that it is absolutely essential that the naso-pharynx in syphilitics should be carefully watched and kept in a normal state, in order, first, that no drawbacks to a mercurial-and-iodide-of-potassium treatment may exist there, and, second, that syphilitic processes, so prone to develop there, may be prevented. To sum up, therefore, I will say that in all cases the condition of the nose, pharynx, and mouth of syphilitics must be sedulously watched, and if necessary treated during the whole period of general treatment. By following this advice, many a time will the physician be able to prosecute his treatment, whereas otherwise he would have had to stop for a time or give it up.

As a rule, salivation does not come on very abruptly; as Fournier says, "it does not burst out like a thunder-clap; it announces itself." But it must always be remembered that after the ingestion chiefly of calomel and blue pill, in the course of the inunction-treatment applied with too lavish a hand, in case of the too frequent repetition of very strong mercurial fumigations, and during an active course of hypodermic injections, particularly when the insoluble salts of mercury are employed, very sudden and severe, even alarming, salivation may occur. In these cases severe gastro-intestinal complications may be present. With the avoidance of an intemperate and careless system of medication, and with the watchful attention of the patient by his physician, these formidable accidents will rarely occur.

The most common symptom of mouth-lesion produced by mercury is a sensation of soreness of the gums, felt chiefly upon cleaning the teeth, and also in mastication, or from contact with vinegar or other acid fluids. Other patients will first experience uneasiness and pain around one or both wisdom teeth. In either of these instances of gingivitis we find the gums red, swollen, and more or less exulcerated, and perhaps at their teeth margin covered with a film of necrotic tissue or membrane which consists of microbes and degenerated epithelial cells. In some cases this condition is confined to the interdental prominences of the mucous membrane; in others the entire gums are swollen, softened, and tender. Under these circumstances the teeth often feel very uncomfortable, and even painful; they become more or less loose, and the patient feels that they are longer than usual. In very bad cases they drop out. As concomitants of this state there is a metallic taste in the mouth and the breath is more or less fœtid. Other patients will first complain of a metallic taste in the mouth, and it will be noticed then that the breath is disagreeable. Or before the supervention of these symptoms they may notice that the quantity of saliva is increased, and it may be watery or more or less viscid. Inspection of the mouth then shows a general condition of œdematous hyperæmia. The gums and the mucous membrane of

the cheeks at the root of the tongue and of the pharynx are of a deep-red or a whitish-red color. The submaxillary glands may be more or less swollen and painful, and the parotid may likewise be affected. Unless the process ceases, either spontaneously or as a result of treatment, the swelling of the parts increases, the tongue swells, the mouth can with difficulty be opened, and then not to its full extent, the teeth make deep impressions in the mucous membrane of the cheeks, and ulcerations may occur. In these severe cases the suffering of the patient is very distressing and painful, and deglutition is more or less impaired. The patient cannot chew or partake of solid food, and has to rely upon milk and nutritious liquids for sustenance. To add to his trouble, he grows weak, nervous, restless, and apprehensive, he sleeps little, and has no comfort anywhere. His pallid, anxious facies, his immobile and perhaps swollen mouth and lips, together with the constant flow of viscid saliva and the fœtid breath, present a truly pitiable spectacle. Luckily, we now-a-days very seldom see these formidable cases of salivation.

A general depression and impairment of the nutrition of the body sometimes occurs quite early after the ingestion or absorption of mercury. But those cases in which it may be said that there is an intolerance to mercury are happily very rare. In most of them it will be found that if the mercurial by the mouth be stopped, and its guarded use by inunction or hypodermic injection be substituted, the intolerance will cease, and that the drug will work satisfactorily.

As a result of greatly prolonged mercurialization, general debility and impaired nutrition of the body are very frequently produced. In very many of these cases the syphilitic diathesis is still active, new lesions appear, while old ones refuse to disappear, and coincidently the patient begins to look pallid and sickly, to be weak and apathetic, and to suffer more or less from nervous depression. This condition is a frequent outcome of the continuous mercurial treatment, and is sometimes seen in persons who, fearful of the disease, have an insensate and irresistible desire continually to dose themselves with mercury. It is attended with dilatation of the stomach, gastro-enteritis of a mild and chronic type, perhaps colitis, and a general impairment of the nervous system and of the nutritional powers of the body. Under an enlightened system of antisyphilitic therapeutics in its broadest sense such conditions as these can be readily avoided.

Such is the value of iodide of potassium in the treatment of syphilis that, although we cannot call it a specific or an antidote in a general sense, it certainly may be termed an essential adjuvant or an important helpmate to mercury in the treatment of that disease. We may even go farther than this, and claim specificity in some cases in which, owing to the nature of the lesion, mercury takes second place and the iodide

the first. In other portions of this essay the therapeutical value of, and indications for the use of, this drug are described. We shall here consider the drawbacks and accidents which sometimes complicate its employment. Iodide of potassium is rapidly absorbed into the circulation, as can readily be shown by the starch test applied to the mouth or by touching the tongue or mucous membrane of the mouth with a solution of nitrate of silver. The starch test promptly shows the blue color of iodide of starch if iodine is present, while the pearly nitrate-of-silver stain is quickly turned into a yellowish hue, owing to the formation of iodide of silver. It is by many thought and claimed that iodide of potassium assists in the elimination of mercury from the economy. Melseus and Guillot claimed that this drug was capable of rendering soluble mercury or any of its compounds retained in the tissues of the body, and of causing their elimination with the urine. On the other hand, Suchoff[1] claims, after very minute and careful investigations, conducted under the supervision of Professor Tarnowsky, that the iodine salt really retards the elimination of mercury. Suchoff claims that the elimination of mercury by the urine begins later, and the quantity of mercury eliminated is comparatively smaller, when the patient is taking at the same time iodide of potassium.

Iodide of potassium administered during or after a mercurial course lessens at once the quantity of mercury eliminated daily. The practical conclusion to be drawn from these observations is that the iodide is not useful in mercurial poisoning, but, on the contrary, may be harmful. My own experience in the treatment of mercurial stomatitis has convinced me that no benefit whatever results from the administration of iodide of potassium.

Clinically, however, it is very frequently found that the long-continued use of mercury having failed to give relief or having produced a cachectic condition, the substitution of iodide of potassium is followed by involution of the symptoms and improvement of the health. This fact, however, does not warrant the conclusion that the auspicious result was due to any effect produced by the iodide upon mercury supposed to be stored up in the system.

The advocates of the expectant treatment and the antimercurialists (if any now exist) are impressed with the value and virtues of iodide of potassium in early secondary syphilis, and also later in the course of the disease. That this remedy is useful for some of the lesions of the early secondary stage has been pointed out in other portions of this essay, but it certainly does not follow that it is appropriate as a systematic remedy to take the place of mercury. Indeed, much harm, in the long run, is done by the indiscriminate use of the iodide, particu-

[1] "Effect of Iodide of Potassium in Combination with Mercury in Temporary and After-treatment by Mercury," *Vratch*, 1886, vii. p. 840, *et seq.*

larly in the exanthematic stage of syphilis. In this stage of syphilis there is a tendency to hyperæmia as well as hyperplasia, and very often the iodide renders worse, and even obscures, syphilitic lesions of the mucous membrane of the mouth, throat, and also lesions of the skin. Again, as we shall shortly see, the iodide itself produces multiform lesions of the skin and mucous membranes which are often very difficult to distinguish from syphilitic lesions. I have many times seen syphilitic infiltrations have their starting-points in inflammatory foci in the skin and mucous membranes which were caused by the iodide. Further than this, the iodide is inert against most of the early lesions of syphilis, and is powerless to cure the general condition. Therefore this remedy should be looked upon, as a rule, as harmful in early syphilis, and should not be employed, but it should be used in the cases and with the limitations which I have specified elsewhere.

Iodide of potassium is rapidly absorbed when taken by the mouth, which is the most common mode of its administration. It is also absorbed, well diluted in water, when injected into the rectum, but its use in this manner very often has to be suspended by reason of local intolerance. The researches of Welander have shown that this salt, administered by the mouth to a syphilitic mother, may be found in the urine of the newly-born offspring. Considering the vast number of people, old and young, who for longer or shorter periods take iodide of potassium, it certainly must be confessed that, as a general rule, the remedy is well borne by the human system. There are, however, many persons with whom the drug disagrees more or less actively. These persons are said to have the iodide-of-potassium idiosyncrasy; that is, that in one way or another the drug produces unpleasant and even toxic effects in them, which we group under the general term iodism. We also read of iodide-of-potassium intolerance, but the truth is that the cases are very exceptional in which the drug is so badly borne that its use is to be totally suspended. While there are many persons who have a greater or less idiosyncrasy against the iodide, there are few who are wholly intolerant of its use. Several years ago it was claimed by H. C. Wood[1] that in all cases of doubtful diagnosis of cerebral syphilis the so-called therapeutic test should be employed, and if 60 grains of iodide of potassium a day fail to produce iodism, for all practical purposes the person may be considered to be a syphilitic. This far-fetched assumption was very properly questioned and combated by J. William White,[2] who, in a circular letter to many syphilographers and physicians, solicited their opinion on the

[1] "Iodide of Potassium in Syphilis: a discussion by J. William White and H. C. Wood," *Therapeutic Gazette*, Dec., 1888.

[2] "Contribution to the Discussion of the Diagnostic Value of the Tolerance of the Iodides in Syphilis," *Therapeutic Gazette*, March 15, 1889.

subject. Twelve replies were sent, in all of which it was claimed that personal idiosyncrasy to the iodides was as great in non-syphilitics as in syphilitics; that there are no satisfactory grounds for the assertion that syphilis in any of its stages prevents the production of iodism; and that it is most unsafe to base any diagnostic conclusions upon the presence or absence of toxic symptoms (iodism) after the administration of full doses of the iodides. As stated in my reply to Dr. White, so I may state here, that I think Dr. Wood's therapeutic test a fallacy.

There are many peculiar facts connected with the iodide idiosyncrasy. In some cases a very small dose (a fractional part of a grain) will produce very severe and even alarming effects, and we may be unable even by means of many and varied expedients to overcome the intolerance. In other cases a very small dose will produce unpleasant and even severe effects, whereas a large one will be well borne, either at first or after several trials. In some cases I think that we, to use an apt expression, weaken too quickly, and give up the drug after a little rebuff, whereas with proper moral courage (the urgent necessity existing) we can increase the dose and, by persisting, establish toleration. I have seen cases in which an intolerance of the iodide of potassium lasted twenty years, and at both ends of that period produced a characteristic bullous eruption. On the other hand, I have seen many cases like that of a man who had gummatous infiltration into the soft palate, and was intolerant of iodide of potassium, but in whom I pushed the iodide until iodism ceased and the new growth was absorbed. Four years later (after a life of great indulgence) he had syphilitic pachymeningitis, took heroic doses of the iodide, showed no intolerance, and got well. In many cases abstinence from liquors, alcoholic and fermented, care as to the simplicity and easy digestibility of food, requisite medication for the stomach, and a general improvement of the condition of the alimentary canal, will be followed by a proper acceptance of the drug, after perhaps some preliminary skirmishing. I have seen several cases in which the iodides were well borne previous to the onset of pathological changes in the kidneys, and after the establishment of the latter they were more or less toxic in their action—sometimes so much so that their administration was of necessity suspended. There is very much evidence, scattered through medical literature, which goes to show that pathological conditions in the kidneys are a very frequent cause of the iodide idiosyncrasy. I can call to mind cases in which, while the patients were high livers and deep drinkers (one exclusively of champagne), the iodides had more or less toxic action, but when they discarded these irritants and stimulants the iodides produced no disturbance. In syphilitics, as in non-syphilitic subjects, an intolerance of to-day may be replaced by a condition of assimilation a month, a year, or more later. This

fact should be remembered in practice, for there is a tolerably widespread opinion that the iodic idiosyncrasy is a lifelong condition.

In many cases symptoms of iodism appear early in the use of the drug; in others this complication is more or less delayed. Its supervention should not, however, lead to too early an abandonment of the drug. It is claimed by some that the presence of free ammonia (the carbonate or aromatic spirit) in a solution of iodide of potassium will prevent iodism, and by others that an alkaline salt, like the bicarbonate or acetate of potassium in combination, will also have this salutary effect; but it is not well to rely too implicitly upon these statements.

Slight or severe nausea and griping pains in the bowels may follow the ingestion of iodide of potassium. They can hardly be called toxic effects, however, for they are usually readily prevented by the addition of a little tincture of ginger or capsicum to the mixture, or of a small quantity of tannin.

The toxic effects of iodide of potassium and of the other iodides may be mild or severe; they may be simple in character, or, again, they may present a marvellous multiformity. Only a general outline of these symptoms and lesions can be given here.

The most common early symptom of iodism is a metallic taste in the mouth and throat, with sometimes fœtor of the breath. Coryza, mild and severe, is also frequently complained of, and is often regarded by patients as cold in the head. There may be mild conjunctivitis and lachrymation combined with the coryza, which may be accompanied with much sneezing and irritation of the nose and eyes, and very often severe pain in the frontal sinuses. In some cases what is called iodide grip is observed. In these rather rare instances the upper air-passages, the eyes, and lachrymal ducts are very much swollen and red. The face becomes swollen, and a red blush resembling erysipelas may be present. The pharynx becomes red and swollen, and the œdema may extend to the epiglottis and glottis. The patient suffers much from burning sensations and from pain, from dyspnœa, hoarseness, and dysphagia. Together with this formidable condition there are fever, weakness, pain in the head, and extreme restlessness. Fenwick[1] reports a case of this form of iodism in which, after four ten-grain doses of the iodide of potassium, there was such œdema of the glottis and difficulty of breathing that the patient's life was only saved by tracheotomy.

In other cases salivation occurs, which, however, is not usually as severe as that due to mercury. In most cases it is of a mild and ephemeral character.

Neuralgic pains in the head or jaws are very frequently complained of, and some patients suffer from more or less severe toothache while

[1] "Severe Case of Iodism: Tracheotomy," *Lancet*, Nov. 13, 1875.

taking this drug. In other cases there is swelling of the parotid, submaxillary, and sublingual glands, which gives rise to very uncomfortable symptoms in the neck.

It is not uncommon to see œdematous hyperplasia of the soft palate, of the tissues around the root of the tongue, of the tongue itself, and of the pharynx, in cases of acute or chronic iodism. I have under observation at the present time a gentleman suffering from secondary syphilis who, as a result of the improper and intemperate use of iodide of potassium, has swelling of the pharynx and root of the tongue, with much turgescence and prominence of the circumvallate papillæ, who was told by a prominent surgeon that he had cancer of the tongue and that his only hope was in a free extirpation of that organ. This inflammatory condition of the throat and mouth from the use of iodide of potassium, particularly when given in large doses and for long periods, is not at all uncommon, is little understood, I find, by the profession at large, and is a source of trouble and annoyance both to patient and physician.

The toxic effects of the iodides, chiefly of potassium, upon the skin are very numerous and multiform in character.[1] They may all be classed under the general head of dermatitis, of which we find a papular and papulo-pustular form (urticarial), tubercular, tuberous, nodular, bullous, and ulcerative. Besides these essential inflammatory dermal lesions the iodides may produce purpura, probably from their defibrinizing effects upon the blood. In some cases iodide of potassium produces such rapid and feeble action of the heart that its use must be given up.

Though last to be mentioned, particular attention should be called to the gastro-intestinal effects and intolerance of the iodides, chiefly of the iodide of potassium. In most cases the stomach receives the drug kindly; in others it produces a feeling of discomfort and impairs digestion. This condition may soon pass off, either spontaneously or as the result of proper medication and alimentation. In other instances it is a very serious drawback, necessitating the suspension or even the abandonment of the drug. It is always well (the necessity existing) to use every possible means to overcome this troublesome complication. After the long use of full doses of the drug patients very often complain of distressing dyspeptic symptoms and of weakness, and show evidence of emaciation. Their heart-action may be weak and their nervous system profoundly affected. Indeed, a condition of cachexia, or even of neurasthenia, may thus be induced. In such cases we must stop the use of the drug at once, put the patients upon a careful regimen, see that their hygiene is made satisfactory, build them up with tonics, and bring to their aid all fortifying influences.

[1] See my *Clinical Atlas of Venereal and Skin Diseases*, Philada., 1889, for further particulars.

It is said that long-continued use of the iodides may produce structural lesions of the kidneys.

Persons are frequently met with who have taken iodide of potassium for many years, and who are still obliged to continue it if they would keep their symptoms in check. They generally become familiar with its use, and take it in large quantities, without the physician's advice, as regularly as they take their meals. Other patients cannot, or believe they cannot, tolerate it even in the smallest doses. These are difficult cases to deal with in emergencies. Sometimes the evil is imaginary, and the idea may be dispelled by a little adroitness upon the part of the physician.

As an internal remedy *Iodol* was first used by Pick[1] in a few cases of tertiary syphilis. This observer claims that he observed sufficiently favorable results from its use to warrant its continuance as a therapeutic agent. He observed that very little toxic effect was produced by the drug, and that it had a moderately energetic therapeutic effect. Cervatesco[2] also claims benefit in gummatous effections of the pharynx, hard palate, larynx, and liver in doses of two or three grains three times a day.

Szadek[3] has used iodol in seventeen cases of tertiary and five of secondary syphilis. This author used the drug in doses of from 8 to 16 grains three times a day, continuously for two or three months. He thinks that its value consists in its harmlessness, tastelessness, and absence of odor, and in the large proportion of iodine which it contains. He found no disturbance of the gastro-intestinal canal from its use, and claims that the therapeutic results were most satisfactory, except in two cases of chronic syphilitic hemiplegia. Szadek thinks that its action is like that of other preparations of iodine, but that it is less energetic than iodide of potassium. He believes that iodol can be used instead of iodide of potassium when a mild and prolonged action is desired, but that when a rapid and energetic action is necessary it is well to employ the latter drug.

I have given iodol a careful trial in public practice in a goodly number of cases of tertiary syphilis, in which the iodide usually acts promptly and satisfactorily, and have become convinced that it has very little, if indeed any, noteworthy therapeutic effect. In this experience I find that I am in accord with Schwimmer.[4] Though I have

[1] "Ueber die Therapeutische Verwendung des Iodols," *Vierteljahr. für Derm. und Syphilis*, 1886, p. 583, *et seq.*

[2] "Ueber die Therapeutische Verwendung des Iodols bei inneren Krankheiten," *Berl. klin. Wochenschrift*, 1889, pp. 26–29.

[3] "Die Therapeutische Verwendbarkheit des Iodols in der Syphilidolgischen Praxis," *Wiener med. Presse*, Nos. 8, 9, and 10, 1890.

[4] *Die Grundlinien der Heutigen Syphilis-therapie*, Hamburg, 1888.

not observed toxic catarrhal symptoms, I have seen disturbance of the stomach and diarrhœa produced by doses of 5 and 10 grains.

For some cases of late secondary and early tertiary lesions of the skin, particularly when attended with scaling, Donovan's solution—liquor arsenii et hydrargyri iodidi—is sometimes beneficial. The dose is 5 to 10 drops, given in a bitter tincture and well diluted with water, an hour after eating.

Decoctions and infusions of such vegetables as sarsaparilla, yellow dock, saponaria, stillingia, and others have long been held in high esteem by the laity for the treatment of syphilis. They have absolutely no antisyphilitic influence, and if they are beneficial at all, the effect is due to their influence as tonics, stomachics, diuretics, or diaphoretics. They may be beneficial as adjuvants to mercury and iodide of potassium.

In Germany largely, and in America not very frequently, Zittman's decoction is used in old, obstinate cases of syphilis when the usual remedies are badly if at all borne, and when the physician is at his wits' end to know what to do. In many very unpromising cases I have seen beneficial, and even striking, results; hence this remedy should be kept in mind. The formulæ for the strong and the weak decoctions are as follows:

Zittman's Decoction—Strong.

℞. Sarsaparilla, cut, ℥xiiss;
Water, ℥325, troy.
Digest for twenty-four hours, and add—
Alum,
Sugar, āā. ʒvj,
enclosed in a linen rag. Heat by a steam-bath, in a covered vessel, for three hours, adding toward the close,
Anise,
Fennel, āā. ʒiv;
Senna, ℥iij;
Licorice-root, ℥iss.
Express, strain, and after several hours decant. It should weigh 312 troy ounces. Put aside as a strong decoction.

Zittman's Decoction—Weak.

Add to the dregs of the strong decoction,
Sarsaparilla, bruised, ʒL;
Water, ℥325, troy.
Heat by a steam-bath, in a covered vessel, for three hours, adding toward the close,
Lemon-peel,
Cinnamon,
Cardamom,
Licorice-root, āā. ʒiij.
Express, strain, and decant; it should weigh 312 troy ounces.
Label "Weak Decoction."

When decoction Zitmani (with one *t*) is prescribed, it is prepared in a similar manner, except that to the sugar and alum are added, enclosed in a linen bag—

℞. Calomel, ʒj;
Cinnabar, gr. xv.—M.

Of the strong decoction it is necessary to drink a pint in the morning, and of the weak a quart in the evening. The effect of this treat-

ment is enhanced by placing the patient in bed and inducing well-marked diaphoresis. These large doses produce also a cathartic action, sometimes very violent, and it may be necessary to reduce them. I have seen much improvement in the patient's general condition produced by this method. It frequently improves the appetite, and by its cathartic and tonic effect renders the system tolerant of active antisyphilitics, which previously had acted badly.

Under the name "succus alterans" a remedy has attained much vogue within a few years in the treatment of syphilis, chiefly among the laity. It is made of roots and herbs. This preparation was first exploited by the late Dr. J. Marion Sims, who claimed that it had produced wonderful results in the treatment of syphilis in Southern negroes. The following is a modification of the prescription of Dr. McDade, in whose practice Dr. Sims first saw it used:

℞. Ext. smilacis sarsaparillæ, fl.,
Ext. stillingia sylvat., fl.,
Ext. kappæ minoris, fl.,
Ext. phytolaccæ decand., āā. f℥ij;
Tinct. xanthoxylon carolin., f℥j.—M.

Take a tea-spoonful in water three times a day before meals, and gradually increase to table-spoonful doses.

I have seen many patients who have taken this remedy at the advice of physicians and of their own accord, and have never seen it produce the slightest antisyphilitic effect. In some cases it seemed to exert a mild tonic action, and in others produced a pleasing purgative effect. It is a remedy in high esteem among some syphilitic cranks, who, though cured, will persist in swallowing drugs. I have known it to be prescribed as a placebo in the intermissions of a mercurial course. Doing no harm, it can do little good, and the human race will not be the loser when this compound shall have had its day.

As an adjuvant in the treatment of syphilis the fluid extract of coca is a very valuable agent. It is in no sense a specific, and its beneficial action consists in its marked tonic effect upon the heart, capillaries, and nervous system, and upon nutrition in general. In anæmia and cachexia and in the adynamic condition occasionally induced by mercury and iodide of potassium it sometimes works wonders. In some cases I have seen it induce a condition of health by which mercury, which at first was badly borne, become tolerated and curative. In malignant precocious syphilis it acts well by improving the general nutrition. It is very often beneficial to patients addicted to alcoholics, and it may then take the place of those stimulants. My favorite prescriptions are as follows:

℞. Fl. ext. erythroxylon cocæ, f℥ij;
Tinct. cinchon. comp.,
Tinct. gentian. comp., āā. f℥ij.—M.
Sig. Two tea-spoonfuls in a wine-glass of water three times a day, an hour after meals.

℞. Fl. ext. erythroxylon cocæ, f℥ij;
Tinct. gentian. comp.,
Tinct. cinchon. comp., āā. f℥j;
Elix. calisayæ, f℥iv.—M.
Sig. One table-spoonful in a wine-glassful of water three times a day, one hour after meals.

The *thé Mariani* is a very reliable preparation of coca, being practically a fluid extract. In some cases this preparation produces sour stomach, which may be obviated by temporarily reducing the dose. In others, again, a sensation of fulness in the head, burning of the eyes, and buzzing in the ears—in fact, a sensation of mild intoxication—may be produced. Under these circumstances the dose should be reduced.

The use of bichromate of potassium in syphilis is only to be mentioned and condemned.

The Inunction Method.

The inunction treatment, which consists in rubbing into the skin metallic mercury or some mercurial preparation, mixed or suspended in a fatty vehicle, is the oldest method known,[1] and is the one concerning which the testimony of all physicians is that it is the most active, sure, and rapid in its effects of any mode of administering mercury. The objections to it are that it is dirty, unpleasant, and disagreeable; that it soils the skin and the patient's linen and the bedclothes; that it necessitates time and trouble in its use, and subjects the patient to the risk of exposure. For these reasons it is repugnant to many patients, particularly to women. Some claim that the method is unscientific and not exact, which may be true, but it is efficacious. Many authors lay particular stress upon the occurrence of stomatitis from the employment of this method, and give their readers the impression that this danger is inevitable. Such statements are either

[1] Mercurial inunction was used at the very earliest period of the authentic history of syphilis. In Douglas's *Bibliographica Anatomica*, Lyons, 1734, it is said that Berengarius was the discoverer of its merits, as shown by the following: "Jacobus Berengarius Carpensis ita dictus a Carpi civitate in Italia . . . . inunctions ex hydrargyro in curâ luis venereæ primus fuit inventor illoque solo quæstu mirè oppulentus redditus est." Also in Joseph Grünpeck's *Tractatus de Pestilentiali Scorra sive mala de Franzos*, 1496, mercurial ointment for the cure of syphilis is mentioned, as well as a gargle to be used in case of salivation.

based upon the want of a thorough knowledge of this method of treatment and of its technique, or upon results which have followed its careless and intemperate use.

Inunction treatment of syphilis by mercury has, particularly within the past ten years, come into more general use and favor, and the present indications are that it will be more and more widely adopted than heretofore, not only as an adjuvant, but also as the regular system of cure. A very noteworthy fact to be gleaned from the words and writings of the most advanced syphilographers is, that they are gradually losing faith in mercury by mouth-ingestion as the regulation method of treatment, and are using mercurial inunctions much more frequently and for much longer periods than they did in former years. The fear which was once so general as to the use of mercurial frictions has very largely passed away, and confidence in this method is gradually extending. This is largely due to the fact that our knowledge of syphilis is more precise and extended than in former days, and that we are better able to determine the conditions produced by the disease, and also the morbid states actually caused by the improper use of mercury. The indications to-day are, that this mode of treatment will ultimately supplant in a general way the other modes, though mouth-ingestion will of necessity be used in very many cases under certain conditions as a method of expediency, and fumigation will still be employed, and injections given according to the varying condition and peculiar necessities of the cases.

It is a mistaken idea that most patients will not undergo the inunction cure. There are those who, by reasons of indifference and of the drawbacks incident to the method, and for prudential considerations, may be unwilling or unable to submit to it. But, on the other hand, I have found, and others have found and will find, that if the advantages of the treatment are clearly and conspicuously presented to the patient, he—or even she—will usually adopt it. It is also a mistake to think that intelligent, well-to-do patients will, as a rule, refuse this method of treatment. They of course would prefer the simple and expeditious method of mouth-ingestion, but when they are told of the great and paramount advantages of the inunction method, of the immunity from present discomfort and suffering which it offers, and the future cure which it renders so probable, they very generally consent to undergo it. Indeed, in my experience it is much easier to obtain the consent of patients in the upper walks of life to submit to and follow up the inunction cure than it is to deal with patients in a lower sphere of life. Intelligent people, having syphilis, as a rule realize the jeopardy that they are in, and are willing to submit to much discomfort and annoyance, provided they have a reasonable hope that they are to be the gainers thereby. On the other

hand, it is almost a hopeless task for the physician to treat patients who are not intelligent and whose sanitary surroundings are not good. In dispensary practice it is often hard work to make patients use their inunctions, and in hospitals the mercurial friction should be administered by the orderly or nurses, for as a rule the patient will make away with his packet of mercurial ointment, and little if any of it will reach his skin.

Though many authors have written in favor of the inunction treatment, it must be conceded that the writings of Sigmund[1] have done most to popularize the method, to rid it of its dangers, and to place its employment upon a safe and scientific basis. In earlier days the method was followed in a crude and even reckless manner, and as much harm as good resulted from its use. A quotation from Brandis[2] will be of interest in this connection. He says: "Formerly, indeed, the dread of inunction was well grounded: let us consider how patients were treated who were obliged to undergo this course. For weeks at a time they remained shut up in hot chambers filled with mercurial vapor. The ingress of fresh air was carefully avoided, and merely starvation diet was allowed. Nevertheless, surprising cures often took place, which caused so much the more astonishment as the most desperately obstinate and severe cases were selected. But what results were not produced! Salivation, mercurial fever, wasting of the tissues, even death itself, not infrequently followed." Sigmund's dictum was as follows: "In the treatment of syphilis we not only do not require the manifestation of mercurial poisoning, but we cure venereal disorders more surely in proportion as we guard the body from such manifestations."

In adopting the inunction method many considerations should be borne in mind. In the first place, it is absolutely essential that the hygienic surroundings of the patient should be in a satisfactory condition. He should have plenty of fresh air and good, generous food, and should be comfortably situated at his home. He should be as free as possible from mental and physical strain, and should have ample time for exercise, rest, recreation, and sleep. While undergoing this course of treatment he should use every effort to keep his health and nutrition at as high a standard as possible, and to keep himself from hurry, bustle, anxiety, care, worry, and mental over-strain. He should eat such food as will nourish best, and avoid all that taxes his digestive powers. He should be careful to avoid all beverages which tend to derange the stomach or cause diarrhœa. Exposure to cold and dampness must be carefully guarded against, and, though an abundance of fresh air is necessary, ample protective clothing must be worn. In

[1] *Die Einreibungscur mit grauer Quecksilbersalbe bei Syphilisformen*, Vienna, 1878.

[2] *Principles of the Treatment of Syphilis*, Dublin, 1882.

winter flannel should be worn next to the skin, and his bed-room should be well ventilated and kept at a temperature of about 65° Fahr. Moderate exercise is to be commended, but violent, excessive, or exacting physical exertion (the so-called athletic sports) is to be condemned. As a general rule, if the condition of the case is not urgent and will admit of it, it is well during periods of severe cold and great dampness to omit the inunctions if the patient is obliged to be out of doors, and also during periods of intense heat in the city. There is a prevailing opinion among the profession and the laity that persons undergoing an inunction-cure are to an unusual degree liable to take cold. It is well always to see that these patients are not unduly exposed and that they are properly protected, but as I look back I can recall many patients of the out-door dispensary class who, despite warning, exposed themselves to cold while using the inunctions. On this subject Raphael,[1] who had a large out-door-poor service for many years at Bellevue Hospital, says: "As regards the danger to patients of taking cold during its employment, all I can say is that I have repeatedly seen patients come to my out-patient clinic with a considerable amount of the mercury rubbed in upon their person, without the least harm resulting therefrom (though they were cautioned against such a course), evidently having gone about in that condition for days without washing off the ointment, many of these patients being insufficiently clothed at that." My experience in the same syphilitic service many years ago was precisely like that of Dr. Raphael. Brandis very pertinently says on this subject: "Excessive dread of catching cold, even at the present day so widely disseminated, causes frequently great harm. Of course every intelligent patient will protect himself from cold; but we frequently meet with people who make themselves ill by carrying their precautions too far."

The most reliable and efficient preparation of mercury for the inunction cure is the officinal mercurial or blue ointment—unguentum hydrargyri—of a strength of 50 per cent., as a rule. In some cases the mild ointment (25 or 30 per cent.) may be used. It is most important that this preparation shall be well made and perfectly fresh. It is not sufficient simply to order the blue ointment, but the patient should be impressed with the necessity of obtaining a perfectly pure preparation, and should be particularly instructed to purchase it of only reliable apothecaries who frequently renew their stock. Many instances of irritation of the skin are due solely to the rancidity of the ointment rubbed in. The matter of the dose should be carefully looked after, so that absolute precision is obtained. Some

[1] "On some Practical Points in the Treatment of Syphilis with Inunction of Mercury," *N. Y. Med. Journal*, March 6, 1886.

authors—and among them Cheminade[1]—think that lanoline is to be preferred to lard in the manufacture of mercurial ointment—an opinion with which I must emphatically differ. I had some mercurial ointment thus prepared, and it was pronounced by patients who were by no means faultfinding to be very unsatisfactory, in being less readily rubbed in and being sticky, gummy, and much less effective and absorbable than the officinal ointment.

The oleates of mercury have not realized the hopes that were formerly entertained as to their ultimately taking the place of blue ointment in the treatment of syphilis. In the form of 20 and 30 per cent. preparations the oleate of mercury is very irritating to the skin, even more so than blue ointment. My colleague, Dr. Bumstead, used with preference equal parts of 20 per cent. oleate of mercury and simple cerate, which is an unirritating preparation. Of late years I have used a combination of the oleate of similar strength and proportion with vaseline. Schwimmer[2] uses 15 grains of oleate of mercury (20 per cent.), mixed with 30 grains of vaseline—a quantity which he orders for one rubbing. The oleate of mercury, however combined, is rather more apt to irritate the skin than blue ointment, and must be used with much caution and with not too much friction. It is at best a less reliable and efficient preparation than blue ointment, and should be reserved for over-fastidious patients. As a remedy for general medication in syphilis it has little to commend it, and as an agent for local or regional treatment it is far inferior to white precipitate ointment or ointments made of several other mercurial preparations, notably the protoiodide, the deutoiodide, the tannate, salicylate, and the bichloride.

In general, the quantity of mercurial ointment advised by writers is too large. It is essential for the successful treatment of syphilis to avoid the two extremes of very large and very small doses. No arbitrary rules can be laid down, but general principles may be stated, and by them a physician must judge how much of this remedy he shall prescribe. It is important to remember that in general city practice (the patients being usually of the active, busy order) a rather smaller quantity should be used than we should employ upon one who has the opportunity of recreation away from home and its cares. Fournier[3] says that Doyon has been able to use 5 drachms of mercurial ointment at the Uriage Thermal Springs in combination with the waters,

[1] "De l'Emploi de la Lanoline comme Vehicule de l'Onguent napolitain dans le Traitement de la Syphilis," *Gazette hebdom. des Sciences méd. de Bordeaux*, 1887, viii. p. 433, *et seq.*

[2] *Die Grundlinien der Heutigen Syphilis-therapie*, Hamburg, 1888, p. 51.

[3] "De l'Emploi des Frictions mercurielles dans le Traitement de la Syphilis," *Union médicale*, June 11, 1891.

and at other thermal springs larger quantities of the ointment can be used than at home. I have been able, the necessity existing, to use at our seaside resorts, the patients taking daily hot salt-water baths, quantities of mercurial ointment which at home would be harmful. So that we must remember that there is an average, fairly large dose for a patient who is at a watering-place or a rural abode of recreation, and another and smaller dose for those who have to stay at home, and who cannot throw off their social or business cares, but are confined to the daily treadmill of city life.

In general, for adult recreating patients following hygienic rules 60 grains of mercurial ointment may be employed for each friction. This, as a rule, will be well borne by a man of good physique and average build, but it would be too large for a thin, spare man of weakly constitution. At thermal springs as much as 120 grains are sometimes used in their "lightning cures," but such quantities are scarcely called for, and should only be used with the greatest care and circumspection.

For general practice the average dose of blue ointment may be stated at from 20 to 45 grains, a larger dose being used upon robust and well-developed patients, and a smaller one upon those of thin and flabby structure. The early rubbings are largely tentative, with a view of gauging the patient and the dose. The inunction-treatment should never be begun in a careless manner. The case being a suitable one, two or three frictions of 30 grains each may be tried and the effect watched. Some patients bear these inunctions when of generous quantity with remarkable tolerance for very long periods; others, again, show evidence contraindicating their use after from three to six rubbings. Therefore, the physician should have his patient well in hand, and watch him very carefully every day or two until he has been under the treatment for at least two or three weeks. As the frictions are given and benefit is evident, the dose may be increased to 40 or 45 grains of the ointment; and in general, for regular routine treatment, this quantity will be found ample, but in emergencies and exigencies a larger quantity will be required. While the patient is under this treatment (the general and special condition being favorable) the physician must watch and question him, to learn that he feels stronger and even gains weight, which is very common when this treatment is beneficial, and is really one of the first signs of improvement, or that he loses flesh; that his strength is satisfactory; that his appetite is good and digestion perfect; that he has no elevations or oscillations of temperature; that he sleeps well at night and awakes refreshed; and that he is in no manner troubled with any nervous symptoms, even slight. If, in short, a man shows evidence of doing well, has no mouth, stomach, or intestinal troubles, and it is evident

that his lesions and symptoms are being bettered, the physician may know that he is on the right track, and should go ahead, but should always be on the lookout for the mouth and the gastro-intestinal tract. When mercury is thus introduced through the skin, it is thought that it enters not by the lungs, but by way of the sweat, hair, and sebaceous follicles into the lymph-spaces, and then it becomes albuminized and ready for absorption. We then have the stomach free for food, tonics, or the iodide of potassium if it is indicated. Thus we may improve digestion and nutrition by agents, such as iron, quinine, strychnine, coca, hypophosphites, etc. This coincident tonic course is often very beneficial in improving the condition of the syphilitically affected tissues, and in rendering them more amenable to the specific action of the mercury. In this connection it is to be prominently remembered that a decided tonic action is produced by generous, nutritious diet, which does so much to engraft upon the tissues the power of resistance to the syphilitic poison. This fact has recently been well brought out by Dymnicki,[1] who strongly advises quinine in weak and debilitated syphilitic persons whose temperature and weight are subject to great oscillations. By its use the bodily weight is increased and general improvement follows. Dymnicki found—and my experience is in accord with his—that in many cases the use of quinine enables us to increase the quantity of mercurial ointment. Schwimmer[2] advises in weakly and anæmic persons a preliminary course of the syrup of iodide of iron before beginning the inunction treatment. In my own practice I have often derived benefit from a similar course.

The next consideration is the preparation of the skin for the inunction treatment. The circumstances and conditions are rather different when the treatment is received at home from that administered at thermal baths and at health resorts. When the patient undergoes the frictions at home he must first have a local or general bath. As a rule in city life, the inunctions are of necessity taken in the evening, whereas in health resorts it is well that they should be taken in the morning. The home patient may take a bath at a temperature of 96° to 98° F., after which he should be well rubbed with a towel. When possible, in warm weather one or two Turkish baths a week may be taken in alternation with the regular baths. But of these baths the physician must be very watchful, and if they in any way tend to debilitate the patient, who under the circumstances sleeps poorly and awakes unrefreshed, stiff, and weak, they should be discontinued. Under these circumstances, and when it is impossible to have bathing facilities, the part to be

[1] "Action of Quinine in some Grave Cases of Syphilis treated by Inunction, affecting Temperature, Pulse, and Weight of Body," *Gaz. Lek. Warszawa*, 1889, 2, 8, ix. p. 388, *et seq.*

[2] *Loc. cit.*, p. 79.

anointed should be carefully washed with warm water and soap, and then sponged with a 2 or 3 per cent. solution of carbolic acid. This latter application should also always be used after the general bath. By strict attention to the aseptic condition of the skin we can almost always avoid dermal inflammatory complications. When it is urgently necessary to treat parts covered with hair, they may be clipped, or even shaved, and then thoroughly washed with the carbolic solution. Upon parts sparsely supplied with hairs great care should be taken that an aseptic condition be produced. By means of this care many unpleasant drawbacks may be avoided.

It is always best that the inunctions should be made by a professional rubber or a trained nurse, if possible. If, owing to circumstances, the patient must be his own rubber, he should be made clearly to understand the technique. In the first place, the physician must see that the dose is made precise, and if the ointment is put up in packets of oiled paper allowance must be made for the loss occasioned by the adherence of some of the ointment. Then no glove or pads or protective coverings to the hands should be used. It is a mistaken idea that persons administering the inunctions are liable to salivation, for they are not, provided they take ordinary precautions. I have employed many trained rubbers and nurses in this treatment, and I have never seen any untoward condition of the hands result. Brandis, Wilson,[1] and others, who have had much experience at Aix-la-Chapelle and at our own Hot Springs of Arkansas, also speak of the immunity to local and general mercurialization enjoyed by professional rubbers. The simple procedure of anointing the hands with oil or with a stiff simple cerate, or even with soap, will effectually prevent the absorption of the mercurial ointment.

The ointment should be divided into several portions, and each one should be firmly rubbed into the skin, employing the two palms when the anatomical arrangement of the parts will admit of it. Combined with the friction, a moderate amount of massage may be practised. In this way all the ointment must be rubbed in, so that no lumps are left, and the surface of the skin will then look as if it had been lightly pot-leaded. As a general rule, from twenty to thirty minutes are necessary for an inunction. After this operation suitable night-clothes should be put on to protect the bed-linen, and the patient should retire. When the preliminary general bath cannot be taken, it is well to let the patient drink directly after the rubbing a pint or more of pure hot milk, and then cover himself up well with blankets in order to induce perspiration. According to his case and to the whim of the patient, hot lemonade or hot tea (and in some cases a little brandy, whiskey, or gin may be added) may be taken to produce diaphoresis after the inunction.

[1] "On the Treatment of Syphilis," *Lancet*, March 27 and April 5, 1886.

For this purpose hypodermic injections of pilocarpine have been used, but, according to my observation, they are not beneficial in any way. Lewin and Zeissl also found pilocarpine inefficient, and even harmful, in the treatment of syphilis.

At thermal springs the patient has his hot bath early in the morning, then his inunction, followed by a period of repose and sweating. After that he is ready for his walk, and during the day may partake of the mineral waters of the place. In my judgment (as I state elsewhere), no specific effect is produced by the waters, either taken internally or used for baths, at the Hot Springs of Arkansas, at Aix-la-Chapelle, or at any other thermal resort. The beneficial effect is largely derived from a variety of conditions, such as climate, rest, recreation, and abstinence. It is very certain that at all springs and health resorts the inunction treatment, vigorously pushed, is well supported. This applies to patients who pursue the method at our seaside resorts and use hot salt-water baths, and also those at thermal and mineral springs. The same tolerance of mercury may be obtained in the mountains and in rural districts if patients are subjected to rigid rules of hygiene and regimen. It is a matter of congratulation that at our own Richfield Springs all the benefits so much vaunted at Aix-la-Chapelle and Uriage may be obtained. When patients are stopping at sulphur or mineral springs they instinctively desire to drink the waters, but they should do so only under medical advice and supervision. It is claimed that sulphur waters exert a depurative action and carry off the mercury and effete products through the kidneys and intestines. This contention is not clearly settled; therefore I usually tell patients to try the sulphur waters in moderation, and if they agree with them and they are semingly benefited, they may continue their use. But very often these waters produce dyspepsia and gastro-intestinal, and even cystic, irritation, and it is necessary to abandon them. The other mineral waters at our resorts should be employed only under proper advice.

Among many of the laity, and among some physicians, there is an impression that the use of sulphur baths and waters internally may have an influence in rendering evident a latent or dormant syphilitic condition, and some physicians at the thermal springs put their patients through what they term a test or proof cure or treatment. In my judgment, this opinion is incorrect, and I agree with Spillman,[1] Brandis, and others that the instances in which, after sulphur-water treatment, a latent syphilis is called into activity are either mere coincidences or the result is due to the same influences which ordinary vapor

[1] "Influence des Eaux sulphureuses dans le Traitement de la Syphilis," *Comptes Rendus de la Société de Médecine de Nancy*, 1882.

or hot-water baths may produce. It has been claimed by Güntz[1] and others that the waters and salts of sulphur springs may be used with benefit in combination with the inunction treatment followed at patients' homes. I have given this method a careful trial, and I have seen it followed in the practice of other physicians, and my opinion is that no perceptible good is gained, though much trouble and expense is entailed. In every large city the facilities for obtaining sulphur baths are ample, and it is advisable in those cases in which the inunctions seem to be backward in their effects to allow the patient to take a few of them as an experiment. In general, one or two sulphur baths a week during an inunction treatment may be a benefit. They certainly have a decidedly happy moral effect on some patients. In cases of ulcerative lesions particularly, and also in those of the papular and tubercular forms, sulphur baths and simple hot-water and vapor baths are often of much aid by reason of their stimulation of the skin.

The points of distribution over the body of the inunction treatment deserve careful consideration. Sigmund[2] advises the following: On the first day both legs are to be rubbed; on the second, both thighs; on the third day, both arms; on the fourth day, the abdomen and breast; and on the fifth day, the sides of the body and the gluteal regions. Dr. Bumstead[3] preferred the following order of applications:

First evening, to the buttocks.

Second evening, to the thighs, but not near the groins or scrotum.

Third evening, to the sides of the chest, but not in the armpits.

Fourth evening, to the internal surfaces of the arm and forearm.

Fifth evening, to the back or belly; the former application is best made by an assistant, whose hand is protected by a glove. (This precaution is not necessary.—R. W. T.)

Sixth evening, omit the application.

Seventh day, take a bath in the morning, change under-clothes, and in the evening resume the applications as above.

Within the past ten years I have seen the wisdom of, and the necessity for, a more extended and comprehensive application of mercurial ointment in the treatment of syphilis; and my observations, worked out upon a clinical basis, have been confirmed by certain pathological studies made by Neumann.[4] This observer has shown that several months (four to eight) after the disappearance of visible syphilitic lesions there may remain in the skin in and around its glands and follicles, and around its vessels, morbid products consisting of exudation

[1] *Die Einreibungscur bei Syphilis in Verbindung mit Schwefel-wassern*, Dresden, 1873.

[2] *Loc. cit.*, p. 37. [3] Bumstead and Taylor, *Venereal Diseases*, 1883, p. 861.

[4] "Welches Sind die Anatomischen Veränderungen der luëtischen Haut nach Ablauf der Klinischen Erscheinungen," *Wien. med. Wochenschrift*, 1885, xxxv., p. 825, *et seq.*

cells. This infiltration of small round cells is not as copious and extensive as it is in very early syphilis, but its occurrence certainly shows how the disease may remain latent in the system. On this subject I may quote with benefit from my recent paper:[1] "There is one fact that the surgeon should always keep in mind in the treatment of syphilis—namely, that all syphilitic lesions, even the most minute, are to be feared as possible sources of continuous or intermittent reinfection of the system. The morbid cells contained in these lesions are capable of great, even infinite, multiplication, and the so-called syphilitic relapses are due to the continual recurrence of these cell-proliferations, which occur from morbid foci left over at an earlier date. While all deposits of syphilitic new-growths in any part or tissue are of much danger in their ultimate results, those which occur in the lymphatic ganglia, in the lymphatic vessels, and around blood-vessels are especially so by reason of the activity of growth of these organs, and of their very ready transposition to all parts of the body by means of the lymph- and blood-circulation."

Pathological facts like these prove to us very forcibly that besides the general mercurial action through the blood, we should, whenever it is possible, bring mercury into direct contact with the syphilitic processes by what is termed the local or regional method. For this purpose the inunction treatment is especially adapted, since by the absorption of mercury through the skin morbid processes there latent are cured without in any way impairing the general constitutional results.

It is very possible that even with a supposed well-regulated inunction course after the older plans, some lesions may escape, and thus the perpetuation of the disease be allowed. This fact is forcibly shown by a case reported by Köbner[2] in a valuable paper on the local and regional treatment of syphilis, of a man who was covered with an unusually extensive and abundant papular syphilide, who had upon the back a molluscum pendulum as large as a nut, upon which there were two papules. After six weeks of treatment, due to enormous induration of the lymphatic ganglia, in which no less than sixty drachms of mercurial ointment were used, all the papules underwent involution except the two upon the molluscous tumor, which had escaped the inunction process. This striking case is only a conspicuous example of what we constantly see when inunctions are not universally made over the whole body. Thus even with toxic symptoms of mercurialization present, syphilitic lesions about the anus and head and elsewhere, which have not been brought into direct contact with the

[1] "Some Practical Points in the Treatment of Syphilis," *Med. News*, Dec. 7, 1889.

[2] "Ueber therapeutische Verwerthung der localen antisyphilitischen Wirkung des Quecksilbers," *Tageblatt der Versamml. Deutsch. Naturf. und Aerzte;* and *Deutsche med. Wochenschrift*, 1884, p. 757, *et seq.*

mercurial ointment, will very frequently be seen to persist. Yet in these cases the patient (and I have very often found his physician to agree with him) thinks that he has been undergoing a most thorough cure, and they both marvel that in spite of such seemingly energetic measures the disease should persist.

Therefore, I say that we should carry out the inunction treatment in a far more systematic, thorough, and minute manner than has been generally done. To this end I divide the body into eleven subdivisions, each of which is to be submitted to its own mercurial friction. They are as follows:

1. The neck and head.
2 and 3. The arms, palms, and axillæ.
4 and 5. The legs and soles.
6 and 7. The thighs, with groins and Scarpa's triangle.
8 and 9. The breast and abdomen.
10 and 11. The back from the root of the neck to lower part of the gluteal region.

In non-hairy persons there is little trouble in anointing the neck. In those whose necks are densely covered with hair we may be forced to confine the inunctions to the parts not covered. In urgent cases and where the lesions are copious it is necessary to have the hair clipped or shaved. If there are scalp lesions or any in the beard an ointment composed of white precipitate 30 grains and vaseline 1 ounce may be used freely. In this case it may be well to make the regular dose of mercurial ointment used elsewhere on the neck smaller. Prior to rubbing the ointment into the scalp and beard shampoos and antiseptic lotions should be used.

It is important that the whole surface of the arms should be acted upon in a vigorous manner. If there are any lesions of the palms, these parts should receive careful attention, and in any case it is well to anoint them several times during the treatment. It is most important to bring the ointment into contact with the contents of the axillæ; and this can be done with impunity, provided care is taken that the parts are brought into an aseptic condition.

The legs and the soles should be well rubbed with both hands, and any lesions upon the latter parts should receive especial attention. In like manner the thighs should be treated, and the groins and the surface over Scarpa's triangle should be firmly rubbed for a sufficient time. If the ganglia in the groins are unusually swollen, it may be necessary to apply a layer of mercurial ointment on lint or one of the mercurial plasters. Great care must be exercised to keep the ointment from the scrotum.

Sometimes the inunctions produce irritation upon the breast and abdomen, and the method is pursued with difficulty. Under these

circumstances all means toward the avoidance of dermatitis and follicular inflammation should be adopted.

Patients rarely have any difficulty in administering to themselves inunctions upon the buttocks, but it is impossible for them to reach their backs. Therefore it is necessary to get outside aid, which in most cases I have found possible. By this method the whole body is treated in eleven séances. In many cases, when we use from 35 to 45 grains of the ointment for each rubbing, we can give the whole series of eleven on successive days. But, as I have said before, we can never be positive that we can do so; therefore the patient must be watched and questioned each day as to his condition. In this way we feel our way along, and continue or suspend the inunctions as the indications of the case teach us.

In giving a regular treatment by inunctions it is well to omit them for a few days, according to the indications, and then to go over the same ground again. In a systematic treatment we may give from fifty to eighty, or even a hundred, inunctions with proper intermissions, and then it is well to desist for a short or long time. In ordinary cases, where the inunction method is used as a regular mode of treatment, it may or may not be necessary to administer the iodide of potassium at the same time. In most cases it will not be necessary to employ a large dose of this salt. But in old and untreated cases it will be necessary to use stronger doses of the ointment, perhaps employ them more uninterruptedly, and combine them with large doses of the iodide given internally. This question of the conjoint use of inunctions and iodide of potassium will be considered farther on in the section upon Special Medication.

It sometimes happens that we desire to keep up a mild mercurial action, and the circumstances of the patient will not admit of the employment of frictions. In these cases the ointment may be spread upon a canton-flannel belt, which may be worn around the body. In cases of enlargement of the spleen, tenderness over the liver, with or without jaundice, pain in the chest (pleuritic or resembling angina pectoris), and in swollen and painful joints, these mercurial bandages may be employed with much benefit. This method is also useful in the treatment of syphilitic infants and children.

Though the inunction treatment is uniformly potent and beneficial, it has its drawbacks and complications. These are—1, dermatitis and follicular inflammation; 2, stomatitis and salivation; 3, digestive disturbances and intestinal complications; 4, sleeplessness; 5, inanition and exhaustion; 6, tendency to congestion of the head, heart, and lungs; 7, tendency to fever and perspiration; 8, pain in bones and joints. Though this list looks rather formidable, in actual practice the cases are few in which it is necessary to abandon the treat-

ment or in which modifications and expedients fail to smooth matters over.

With careful antiseptic attention to the condition of the skin, and with the employment of fresh and pure ointment, we rarely encounter such an amount of inflammation in it that the patient is made to suffer or that the treatment is curtailed. Zinc ointment, Lassar's paste, and dusting powders, with protective layers of cotton, are very beneficial in the prevention of dermal inflammation.

Under the older system of inunction, when a larger quantity of blue ointment was employed, it was not uncommon to find mouth and throat lesions. When, however, the treatment is carried out on the lines heretofore indicated, the occurrence of salivation will be rather rare. Mouth lesions from inunction are similar to those produced by the internal use of mercury, with the exception that their onset is more sudden and abrupt and their severity greater. It is therefore necessary to follow the directions already given in the matter of attention to the teeth, mouth, and throat, to prevent salivation. It is also well to make the patient rinse the mouth well with solutions of chlorate of potassium and alum, and also with a mild solution of sugar of lead and acetate of alumina in peppermint-water. This precaution is particularly necessary when for any reason we are compelled to push the treatment.

Very often a reduction of the dose or its temporary suspension will cause the disappearance of irritability of the stomach. The trouble should also be treated symptomatically. In like manner, intestinal irritation should be treated, and very often much benefit will result from a full dose of castor oil.

In some cases sleeplessness is but an ephemeral symptom. It may persist and necessitate a suspension or diminution of the treatment. The bromides, sulphonal, phenacetin, and perhaps morphine and chloral, may be temporarily resorted to, but always under the physician's knowledge and full direction. It is better to abandon the method than use any of these drugs for a long time.

In women particularly, a feeling of exhaustion and inanition, perhaps with digestive disturbance, may complicate the inunction treatment. The usual expedients of lowering the dose, of allowing intervals of repose, and of administering tonics, should be resorted to. If, after a conscientious trial of the method, these symptoms continue, it must be given up.

Tendencies to congestion of the head, heart, and lungs should be treated symptomatically, and the frictions carefully pushed and watched.

A feverish condition, with or without perspiration, or the occurrence of the last symptom alone, call for quinine and iron tonics,

generous food, and perhaps a mild malt liquor, or even claret or burgundy in moderation.

Pains in the bones and joints, fixed or fugitive, may give more or less trouble. They usually pass away by care on the part of the physician and patient. I have met with several cases, however, in women in which these symptoms were so severe that a discontinuance of the frictions was made necessary.

A mild and continuous mercurial effect may be produced by the application of plasters of mercurial ointment. This may be spread on chamois-skin, and adjusted to the body by means of a belt made of flannel or of canton flannel. In cases of lesions of the spleen or liver or of intrathoracic pains in early syphilis this method of mild mercurialization is very beneficial. It may also be employed in cases in which, for any reason, inunctions are contraindicated. In many cases of hereditary syphilis mercurial ointment may be kept continuously upon one or more regions of the body with decided benefit.

Akin to this method of using mercury is the application of mercurial plasters. The old-time emplastrum de Vigo, in which Chassaignac placed so much confidence, may be used, either in large plaques or on small surfaces for local treatment. There are in the market at present several mercurial plasters which are worthy of use.

This slow and prolonged treatment is much extolled by Unna,[1] particularly for commercial travellers and those very desirous of secresy. He uses a mercurial plaster-mull, and with his usual ingenuity has devised a frame of zinc glue which serves to keep the plaster in place and to prevent it from melting at the edges, with its inevitable discoloration of the skin and the under-wear. In severe cases of paralysis, cranial exostoses, etc. Unna girdles the entire trunk with his mercurial plaster-mull.

A modification of the foregoing treatment has recently been proposed by Quinquaud,[2] who uses a calomel plaster made as follows:

℞. Emplast. diachyli,	3000	parts;
Hydrarg. chlorid. mite,	1000	"
Ol. ricini,	300	" —M.

The plaster is to be melted, and to it added the calomel suspended in the castor oil.

This quantity is to be spread upon linen, so that fourteen strips, each nine feet by seven and three-quarter inches, are produced. Of

[1] "Ueber die Therapeutische Verwendung von Salben und Pflastermullpräparaten," *Berlin. klin. Wochenschrift*, No. 38, 1881, and "Die Medicamentösen Leime," *Aerztlichen Vereinsblatt*, 1886, No. 176.

[2] "Traitement de la Syphilis par le Sparadrap au Calomel," *Bullétin de la Société française de Dermatologie et de Syphilographie*, 1890, p. 63, *et seq.*

this plaster a square of two and a half inches contains 18 grains of calomel. Analysis of the urine of patients treated with this plaster showed the presence of mercury in from six to ten days. The plaster is to be applied over the region of the spleen, the skin having previously been carefully washed. It may be applied elsewhere upon the body, with a view to its general mercurial effect and also for the cure of local lesions. Quinquaud says that the use of this plaster is free from danger and inconvenience, and that by its use mercury is slowly and surely introduced into the system. My own experience with it is not large, but I regard it as a useful addition to our therapeutic measures.

Within the past decade a new method of treatment, which is really a modification of the inunction plan, has been introduced by Schuster of Aix-la-Chapelle,[1] and used by others. This method is by friction of the skin with a mercurial soap made in Paris and called *Savon napolitain*. A good lather is made with water and allowed to dry on the skin, upon which it leaves a thin film of mercury. This may be applied over a more or less extensive surface, but its too frequent application may cause dermatitis. The lather is less objectionable in odor and in feeling than the mercurial ointment; hence Schuster thinks this method is more elegant than inunctions. Improvement in cases of syphilis thus treated was noted, and chemical examination revealed the presence of mercury in the urine. Oberländer[2] endorses the method, but prefers a soap originated by himself, which is composed of one part of mercury combined with three parts of green soap, perfumed with oil of lavender. Oberländer claims that the lather made from this soap is of lighter color than that of the French preparation, and that it is actually absorbed into the skin, even without much friction.

Spillmann[3] advocates a soap made of pure olive oil and caustic potash, with which is incorporated 50 per cent. of mercury. This soap, which may be perfumed according to taste, is neutral in reaction and causes no irritation. A portion of the body is lathered with the soap, and after drying it is covered with thin paper or some suitable garment. After twenty-four hours the part is washed off and dusted with rice powder.

It may also be well to mention Dietrich's[4] mercurial soap, which is

[1] "Die Mercurseife, Savon napolitain," *Vierteljahr. für Derm. und Syphilis*, Heft 1, 1882.

[2] "Die Mercurseife ein Neues und Praktisches Ersatzmittel für die Mercursalbe," *Vierteljahr. für Derm. und Syphilis*, Heft 4, 1882.

[3] "Le Savon mercuriel comme succédané de l'Onguent napolitain," *Annales de Derm. et de Syphilographie*, 1885, pp. 496 and 497.

[4] "Sapo Unguiosus und Seine Anwendung als Salben Körper," *Monatshefte für Prak. Dermatologie*, 1887, p. 1068, *et seq.*

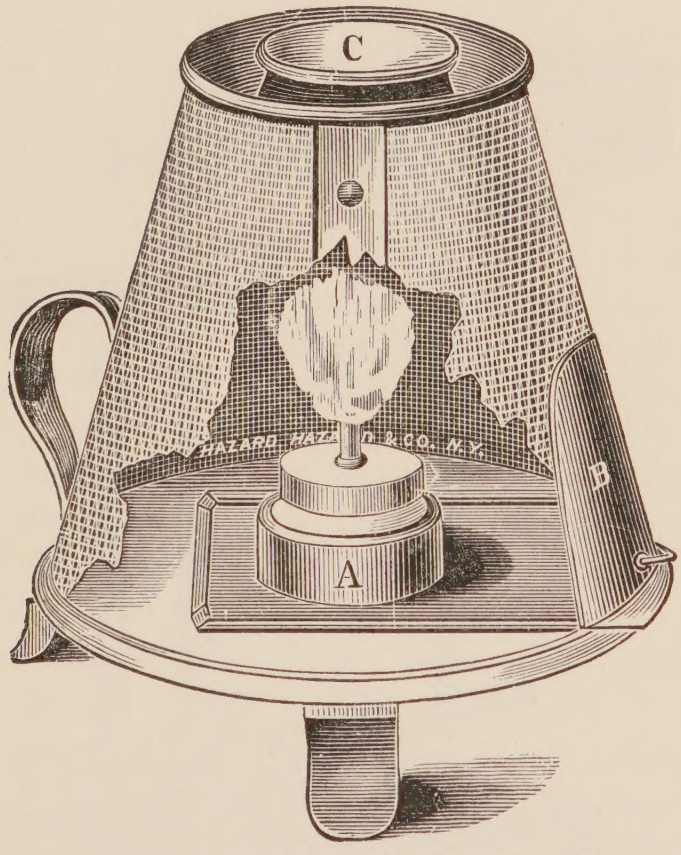
well thought of by Bronson. In my judgment the use of these soaps should be restricted to local or regional therapy.

Fumigation.

The mercurial vapor-bath is a method of treating syphilis which was revived and perfected by Langston Parker[1] and Henry Lee.[2] It is useful in very many cases and in many conditions of syphilis—not as a routine treatment, but as one of reserve and exigency. Many preparations of mercury have been used in this form of treatment, but calomel and cinnabar are the agents upon which experience has shown that most reliance may be placed. To obtain good and satisfactory results these drugs must of necessity be perfectly pure and free from admixture.

When calomel alone is used, from 20 to 40 grains may be placed upon the lamp, but in some urgent cases even 60 grains may be

Fig. 1.



This lamp is now made of wire gauze, and resembles the safety-lamp of the miners, thereby guarding against sudden explosions of the alcoholic vapors.

required. As a general rule, however, the smaller quantities are most serviceable, and they may be used over a longer period of time. The large doses of calomel administered by moist vapor are generally used in cases of severity and of exigency, and are not frequently

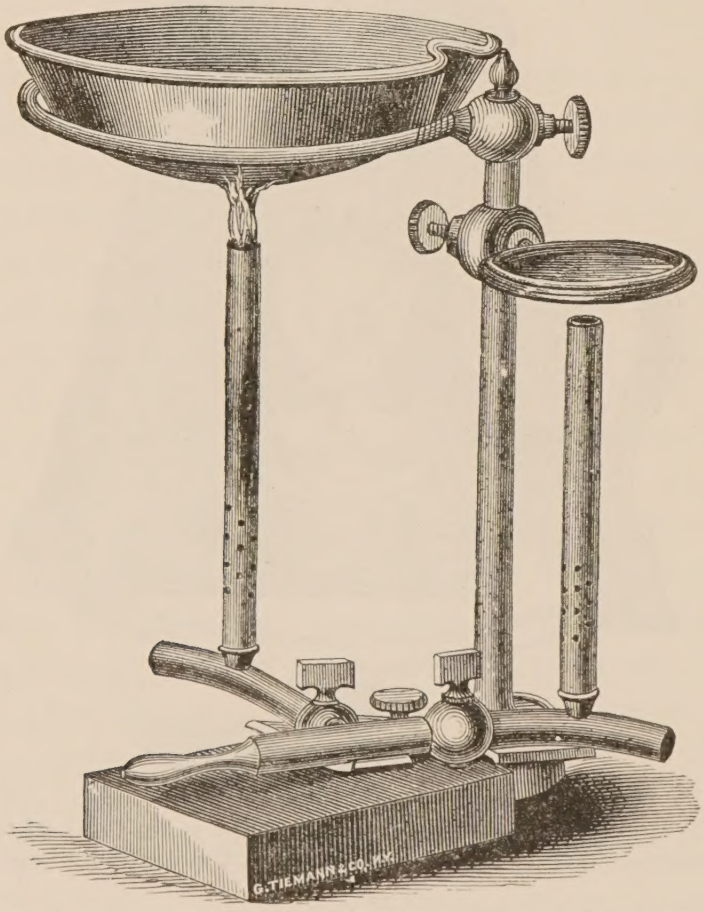
[1] *The Modern Treatment of Syphilitic Diseases*, London, 1871, p. 352, *et seq.*

[2] *Lectures on Syphilis*, Philadelphia, 1875, p. 93, *et seq.*

repeated. Cinnabar may be used in somewhat larger quantity than calomel, but in general my practice is to combine the two salts in one bath. As an average dose I have found that 15 grains of calomel and 20 of cinnabar fused simultaneously in connection with moist heat produce prompt and safe results. This dose may be increased or diminished according to the condition of the case. In large cities there are usually one or more establishments in which these baths are given under the advice of physicians. In that case the physician need only prescribe the dose and the number of baths which he desires the patient to take, and the bath attendants will carry out his wishes. Unfortunately, in some establishments the attendants, having a smattering of medical knowledge, think they know more than the doctor, and proceed to treat the case themselves. As Dr. Bumstead puts it, their "inherent tendency would seem to be to absorb the patient at the same time that he absorbs the mercurial fumes."

In some cases, when the baths are unobtainable or when the patients

FIG. 2.



Dr. Maury's apparatus for moist mercurial fumigations. It consists of two Bunsen's burners, one of which is surmounted by a pan to contain the water, and the other by a small shallow dish for the preparation of mercury. The apparatus is attached by means of a flexible tube to any ordinary gas-fixture.

object to go to the bath establishment, this method may be pursued at home. For this purpose it is necessary to procure the lamp designed by Mr. Henry Lee for fumigations (Fig. 1) or the apparatus invented

by the late Dr. Thomas F. Maury of Memphis. (Fig. 2.) The mercurial is placed in the cup *c* in Fig. 1, while the water is poured into the circular groove which surrounds the cup, about three or four ounces only being used. The patient is stripped and enveloped in one or more blankets or in coverings made for the purpose of mackintosh or India-rubber lined with flannel, and then the flame is started. In a few minutes perspiration is induced, and the evaporated calomel is deposited upon the body. Usually the protective garments fit closely at the neck, but in some there is a slight opening, through which some of the fumes may escape and may be absorbed in respiration. When deemed necessary by the physician the patient may breathe in some of the fumes, but it is always well to allow an admixture of air with them. Twenty to thirty minutes are sufficient for a bath, after which the patient is allowed to cool off slowly. When practicable the patient should retire at once to bed, preferably enveloped in the garment used in the bath. It is well, if the patient has to dress and go out, that as little friction of the skin as possible should be used, in order not to rub off the minute particles of mercury. In cold weather due care should be taken that the patient is properly protected when he goes out after the bath.

These baths should never be taken directly after meals. It is better that they should, if possible, be taken just before going to bed or in the evening, but in any case fully two hours should elapse after a meal. As a rule, patients should be in good condition as to their stomachs and bowels when they are subjected to this treatment, and they must be rigidly prohibited from using alcoholics. While undergoing mercurial vapor treatment the patient must be carefully watched in order that no drawbacks may be encountered. Thus if he complains of feeling tired and debilitated after a bath, it will be necessary to reduce the quantity of mercury and also the amount of water to be evaporated. In many cases harm is done by using too much steam vapor. Some patients complain of headache, and it is then necessary to administer a purge or to moderate the amount of food ingested.

It is well to begin by giving one bath every other day, and then to increase to a bath daily if the necessity of the case demands it. Some patients bear these daily baths well, while others experience unpleasant symptoms from them. As a rule, after one or two baths improvement is observed, but in some cases a beneficial effect is delayed for a week or two. The number of baths to be taken can only be determined by the condition of the case. In general it may be said that a course of baths extending over one or two months will be sufficient for that time. This period, however, may be lengthened. In many cases only a few baths are necessary, they being employed for some temporary condition or as an adjuvant to other methods of treatment.

While a patient is thus being treated the physician should carefully watch the state of his gums and of the gastro-intestinal tract, and remedy any disturbance. It is not uncommon to observe a mild form of mouth lesions in patients taking a course of mercurial baths. This condition may be cured by local means and by the temporary suspension of the baths or by diminishing the strength of the mercurial employed. Sometimes, when large doses have been frequently used, a sudden and violent colitis is developed. This condition, painful and sometimes alarming, is readily cured by rest, cessation of treatment, and the use of opiates.

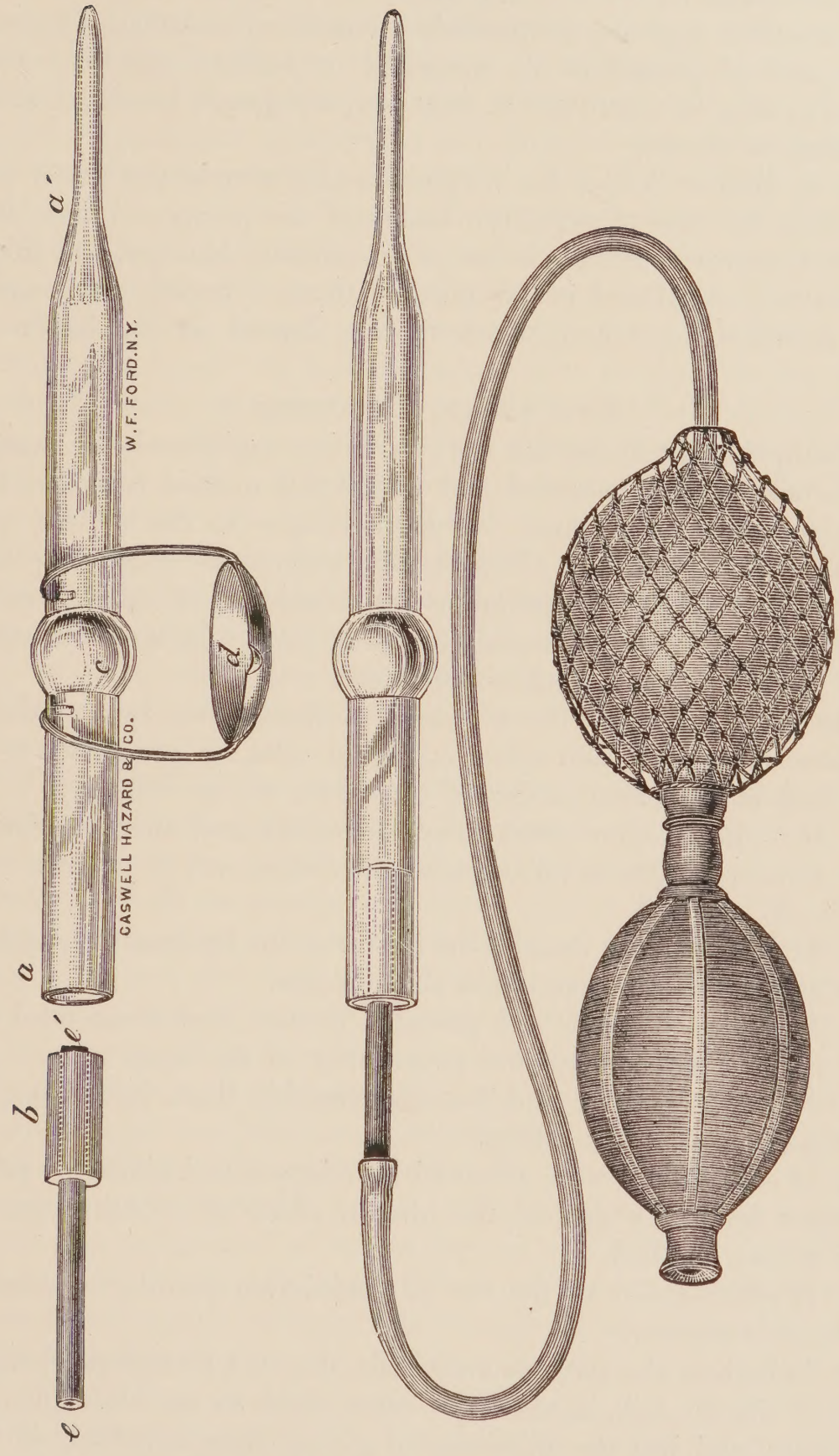
Mercurial baths are useful in the whole secondary stage of syphilis, and also in the tertiary period. They may be employed to remove some obstinate local lesion or to expedite the disappearance of a general rash. Late secondary rashes, rebellious to other methods, are frequently dispelled by this one with promptitude. Neuralgias, rheumatoid pains, cephalalgias, pains in joints and fasciæ are often promptly relieved by mercurial baths. In cases in which for any reasons other methods of treatment are contraindicated we can frequently resort to mercurial fumigations with marked benefit. In the section on Local Treatment the further indications for these baths will be considered. It sometimes happens that an eczematous tendency renders the use of mercurial baths impossible.

Local Mercurial Fumigation.—This method may often be employed with advantage when other applications have failed. Dr. W. S. Smith[1] has called attention again to the methods which he uses not only on the skin, but upon the lips, tonsils, and interior of the mouth and nose. Smith employs an apparatus devised by Dr. F. B. Kane.[2] (Fig 3.) This consists of a glass tube about ten inches long, drawn out to a fine nozzle at a', and cut off with a file at a, the edge being rounded off so as not to cut the cork b, and a slight bulbous expansion at c; the cork is made to fit a and holding tightly the small glass tube $e\,e'$ which passes through it, and a metal cup suspended by two wires about two inches under c. From 5 to 10 grains of calomel are introduced into the glass tube as far as the bulb on the point of a pen, the cork is inserted into the large end of the tube, and the end of the glass tube is attached to the rubber part of a spray apparatus, a small piece of rolled-up lint, or a small wire cylinder filled with asbestos and saturated with alcohol, is placed on the cup and then lighted. While the calomel on the bulb is being sublimed, a gentle current of air is forced through the tube. The result is the deposit of a film of sublimed calomel on the surface of the sore. The nozzle of the tube should be held at a distance of

[1] "Notes on the Treatment of Skin Diseases." *British Med. Journal*, May 7, 1881.

[2] "Mercurial Fumigation: Description of a New Apparatus," *Dub. Journal Med. Sciences*, Nov., 1874.

FIG. 3.



Apparatus for Local Mercurial Fumigation.

from one to three inches from the skin. The fumigation is easy of application, and harmless even on very sensitive parts. It causes no unpleasant results, and is usually not followed by salivation. I regard this as a very efficient therapeutic measure, and have seen many excel-

lent results from its use. It may prove of benefit in hereditary as well as in acquired syphilis, particularly in cases of obstinate ulcerative lesions and of phagedena in secondary or tertiary syphilis. Iodoform may also be volatilized in this way, and prove beneficial in the same class of lesions.

Dr. J. Hunter Wells[1] has proposed a very simple method of local fumigation for cases of syphilitic lesions of the palms. A hole large enough to admit the hand is cut in an ordinary hat-box, and from ½ to 1 drachm of calomel is put underneath on a tripod, and a spirit-lamp produces the fumes, which form a deposit on the hand.

Hypodermic Injections.

Within the past decade the use of mercury hypodermically in syphilis has been largely extended, and to-day this method is held in high repute by many physicians. As I shall show in the sections upon Corrosive Sublimate and Calomel, this method of employing these drugs is, within certain limitations as a measure of utility, reserve, and exigency, of marked benefit in many cases. It, however, should never be adopted as a routine treatment.

The chief claims of the advocates of the method by hypodermic injections of calomel and other mercurial salts, in preference to the older and more classic modes of treatment, are as follows:

1. It is simple, more exact, more convenient, and more expeditious.
2. It is applicable to all stages of the disease and to patients of all ages.
3. The practitioner remains the master of the treatment throughout.
4. It spares the patient's skin and stomach.
5. It ensures accuracy and precision of dose, and is attended with more rapid action and greater potentiality of the drug.
6. It is superior to, and less objectionable than, inunctions, and more permanent in its effects.
7. It is less liable to be followed by relapses, and gives the patient a greater immunity against the ulterior effects of syphilis than any other known method.
8. It effects a *cure* by the use of a minimum quantity of mercury, and at little expense.
9. It bothers the patients very little, does not necessitate change in mode of life or regimen, does not cause them to see their physician very often, and has the advantage of giving them a holiday of eight days, or more when calomel is used, during which they have no medicine to take or medical procedure to undergo.

These claims, it must be remembered, are made by enthusiasts, and

[1] "Injections in Syphilis, and a Handy Method for curing Syphilitic Palmar Psoriasis," *Medical Record*, May 13, 1891.

the reader must not be misled by their scope and boldness. It has been claimed that mercury thus administered has occult curative properties hitherto unknown, but of this there is really no evidence.

Within recent years much has been written eulogizing the effect of insoluble preparations of mercury, and there is at present a tendency to the disuse of the soluble preparations. It is claimed that the soluble salts of mercury are so rapidly absorbed and eliminated that their effect is less potent and much more ephemeral. On the other hand, it is claimed that insoluble preparations of mercury are slowly absorbed, are retained for long periods in the system, and that their effect is more active and prolonged. It is needless for me to discuss these questions here, for the reader can gain very clear ideas by a perusal of the following pages. In my judgment, the soluble salts of mercury are of much benefit in many cases, and their hypodermic use is not attended with the serious drawbacks and dangers incident to the use of insoluble salts hypodermically. In certain cases and with marked limitations insoluble salts, particularly calomel, thus used may be productive of benefit.

In former years injections were made into the connective tissue; to-day intramuscular injections (particularly of the insoluble salts) are largely in vogue. In my opinion, the innovation is neither beneficial nor necessary.

The extent of the literature of hypodermic injections in syphilis contributed within the past ten or twelve years is simply appalling, and in it there is really very little which is of practical value. In an essay like this, in which completeness is aimed at, it is necessary to give a survey of the progress made in the treatment of syphilis. To that end I have gone over and condensed this huge mass of literature, and I present an epitome of it here for what it is worth. It will be seen that almost every preparation of mercury has been experimented with in the hypodermic-injection treatment, and that the chemist's art has been sorely taxed to produce new preparations. Each new preparation has been exploited as the ideal of perfection, and in most cases a hearty welcome has been accorded it, so that a witty German reviewer has made the following paraphrase of an old maxim applicable to the subject: "*De novis nil nisi bonum.*" After all is said and done, the bare fact remains that corrosive sublimate and calomel are the two agents worthy of confidence, and they are not excelled in any way by any others.

For convenience of description, I will divide the preparations of mercury used hypodermically into the following groups: 1, the insoluble salts; 2, the soluble salts; 3, the so-considered antiseptic group; and 4, the amide group. Iodide of potassium, alone and in combination with mercury and iodoform, has also been employed subcutaneously, and the essential facts of its use will be presented.

INSOLUBLE SALTS.—*Calomel.*—Of the insoluble salts of mercury,

calomel is the one most extensively used and most uniformly efficient. Subcutaneous injections of the salt were first recommended by Scarenzio[1] in 1864, and in 1868 that author and his disciple, Ricordi,[2] published a pamphlet of ninety-nine pages in which they claimed brilliant results in the cure of syphilis. Since, at the present time, there is a revival on the part of some physicians in various countries of this method, it is proper that a synopsis of our knowledge should be here presented. Though this treatment, which has become known in medical literature as the method of Scarenzio, was used in Italy and in Germany principally by Sigmund, it had not, until within a decade, been tried, except in isolated instances, in other countries. In the year 1883 a Russian physician named Smirnoff[3] published a pamphlet in which he claimed to have modified and improved Scarenzio's method, and earnestly advocated its general adoption. In the year 1886 this author published a second pamphlet,[4] in which he laid greater stress upon his former claims. These writings of Smirnoff have resulted in a more general knowledge and employment of calomel subcutaneously in syphilis, so that to-day the method of treatment is accepted as a part of their armamentarium by a large number of observers.

Scarenzio claimed—and others have endorsed his view—that calomel introduced under the skin is acted upon by the alkaline chlorides of the blood, and slowly transformed into the bichloride, which in its turn is absorbed into the system. This author thought that 6 grains of calomel, administered in two injections at varying intervals (eight, ten, fourteen, and twenty-one days) into two different portions of the body—and he preferred the outer sides of the arms and thighs—were sufficient for a cure. In the early stages of the trial of this method it is stated that abscesses invariably followed the injections, but this complication was thought little of. Glycerin and mucilage of acacia were the vehicles in which the calomel was suspended.

The views of Sigmund[5] on the treatment of syphilis are generally worthy of close attention, and it is interesting to note that after a prolonged trial of Scarenzio's method he reached the conclusion that we can only assign very narrow limits to the employment of the hypodermic method, and can only recommend it in the milder and more simple forms of secondary syphilis. Sigmund saw very clearly that syphilis could not be cured in the rapid and high-pressure manner claimed by

[1] "Primi tentativi di cura della sifilide costitutionale," *Annali di Medicina*, Aug. and Sept., 1864.

[2] *La Méthode hypodermique dans la Cure de la Syphilis*, translated by Dr. Oscar Max. van Mons, Brussels, 1869.

[3] *Om behandling af Syfilis medelst subkutana Kalomel injectioner*, af Georg Smirnoff, Helsingfors, 1883.

[4] *Developpement de la Méthode de Scarenzio*, Helsingfors, 1886.

[5] *Vorlesungen über neuere Behandlungs weisen der Syphilis*, 3d ed., Vienna, 1883.

the Italian syphilographer, and in his employment of the latter's method he made radical modifications. Sigmund used smaller doses of calomel: instead of 3 grains injected once in eight days or at a longer interval, he used $\frac{3}{4}$ of a grain twice a week, and extended the treatment over a longer period. He preferred the sides of the chest and the belly as the sites of the injections.

In the light of existing knowledge of the treatment of syphilis by hypodermic injections of calomel, the following general summary may be given as to dose, technique, indications, and results:

The calomel must be perfectly pure and reduced by steam sublimation. Some authors go so far as to recommend that it be washed in boiling alcohol and dried. It may be suspended in pure glycerin, glycerin and water, mucilage of acacia, or in vaseline oil. Some observers use equal quantities of sodium chloride and calomel mixed in water. It is better that each dose should be freshly prepared, and in the weighing of the drug and in its trituration with pestle and mortar every precaution should be taken to prevent contamination. As a rule, 1 grain of calomel is sufficient for a dose; and this should be suspended in 10 or 12 drops of the vehicle used. In urgent cases 2 grains may be injected, but rarely is this much required. When the dose is mixed freshly for each injection it is necessary to prepare from four or five times the quantity.

In certain rare cases, particularly of lesions of the eye, ear, and cerebro-spinal system, in which a decided action was needed, I have employed injections of calomel suspended in water which contained chloride of sodium in solution. Krecke[1] has used this treatment on these lines in Strümpell's clinic. His formula is a good one, and is as follows: Calomel and chloride of sodium, of each 5 parts, to distilled water 50 parts. Of this liquid the contents of a Pravaz syringe may be injected every eight or ten days. This combination has been used by many observers, notably Rona, Matthès, Sterne, Neumann, Kopp and Chotzen, Dellen, and Finger.

Smirnoff is certainly correct in insisting upon thorough antisepsis in the administration of these injections; therefore I am careful to enter fully into the necessities of the technique. The hands of the operator should be thoroughly cleansed, and the parts to be injected should be washed with soap and water and scrubbed gently with a brush. After this they should be well saturated with a 5 per cent. carbolic solution, and then dried. The syringe must be kept perfectly clean, after having been rendered aseptic after its last employment. It should have a rather larger needle than usual, one having a calibre about twice as large as that of those generally used, and it should be nearly an inch

[1] "Ueber die Behandlung der Syphilis mit Subcutanen Calomel injectionen," *München. med. Wochenschrift*, 1887, No. 6.

and a half long. The working of the syringe should be easy and perfect, and its adjustment to the needle should be accomplished without hitch or delay. Previous to introduction it should be ascertained that no air has lodged either in the needle or the syringe. The injections are to be made at a right angle to the surface of the skin, and not in an oblique manner. The needle is to be slowly, but firmly, pushed in until the subcutaneous tissues are reached, and then the piston is to be very slowly pushed down. The idea is to produce as little violence as possible to these delicate tissues. Then the needle is to be carefully withdrawn between two finger-tips, pressing carefully but firmly on the injected spot. There is no necessity for light massage or for the application of plaster or collodion over the site of injection, though there is no objection to the latter.

The site of injection preferred by Smirnoff, Jullien, Watrasewski, Klotz, and others is the depression in the buttocks, an inch behind the posterior border of the great trochanter. Here the connective tissue is very lax and abundant, and pressure is not felt in any of the attitudes of our daily life. It is always better that patients should be selected who have but a moderate quantity of fatty tissue; therefore in very fat and closely-knit subjects fear of abscesses resulting from a want of diffusion of the injected fluid is to be entertained. In this limited area of course only a few injections can be made, but it is to be remembered that the advocates of this treatment speak of *cures of syphilis* by the use of *6 grains of calomel.* Other parts of the body may also be selected, but it should always be remembered that there must be plenty of loose cellular tissue, that bony prominences are to be avoided, and that places liable to be subjected to pressure during the day or in sleep must be spared. In some cases of active and grave intraocular, aural, and cerebral lesions the nucha, temples, and scalp have been and may be selected with advantage as sites of injection. Experience has shown that the thighs are prone to undergo abscess-formation from the injection of insoluble, and even soluble, preparations of mercury. Therefore, these regions, as well as the arms and forearms, should, unless under urgent circumstances, be avoided. I have found that injections of calomel and of corrosive sublimate may be made in the hypogastrium when care is taken not to go down to the groins or the mons veneris. The lateral portions of the chest have also been used, particularly by Sigmund.

By some it is advised that the patient should lie down when the injection is made, and it is a good rule in the administration of all forms of mercurial injection to place the patient in such a position that tension is not exerted upon the part to be injected. Though some observers state that they allow patients to go about their business after injection, I am strongly of the opinion that it is well for them to be

quiet for at least an hour or two, or to lie down for several hours if possible.

Until within the present decade calomel injections were made into the subcutaneous connective tissues, and this site of deposit is preferred by some authors. Following, however, a suggestion of Soffiantini, a disciple of Scarenzio, a number of experimenters have thrown the mercurial salt deep into the muscular tissue, where it is claimed in an acid medium absorption is more rapid and certain. In my own practice, with the limitations which I observe as to this method of treatment, I have always injected into the connective tissues, preferring to have a superficial to a very deep subfascial abscess if that unpleasant complication should develop. Whichever site of deposit is chosen by the physician, the greatest care must be observed to get the needle well into the soft tissues. It is very unfortunate to throw the injection into the deep corium; therefore the point of the needle should be well below this layer. An injection should never be thrown into the connective tissues over bony surfaces nor anywhere near the periosteum.

Symptoms of two varieties are observed after these injections—those which develop at once, and those which appear more or less remotely after the operation. In some cases pain in the track of the needle and in the injected focus is complained of. This symptom may be severe and it may be mild. It is often ephemeral in duration, and again it may last one or more hours. As a rule, women complain of it much more bitterly than men.

In some cases a disk of redness and inflammatory hyperæmia of the skin is seen around the point of puncture. If proper antisepsis has been attained, the inflammatory plaque in most cases gradually pales and disappears. If, however, any particles of dirt have been left in the track of the injection an abscess of that part is very apt to form.

Within a few hours or within a day or two in very many—I may say in most—cases a moderate swelling can be felt well under the skin at the injected focus. This nodule may be circumscribed and unattended with surrounding inflammation, or it may go on to the formation of a large and brawny swelling limited to the deep tissues, or perhaps complicated with inflammatory exudation into the derma. The onset of these sequelæ indicates the necessity of rest and quiet, and perhaps the use of cooling lotions. In some instances the nodules will gradually undergo resorption, but in very many softening takes place slowly after the subsidence of the immediate inflammatory symptoms. It seems to be the general opinion that when softening has occurred it is better to refrain from opening the mass, for even when marked fluctuation is felt resorption may occur, or at the worst the abscess will point and burst. In the latter event it rarely causes much trouble in healing, and very seldom leaves sinuses through the skin. These

abscesses may become encysted or they may undergo cheesy degeneration and subsequent absorption. Whereas before Smirnoff's time abscesses were of inevitable occurrence, with the improved technique of to-day they may be rendered very much less numerous than formerly. Even in Sigmund's experiments the number of abscesses was reduced.

To the eye these nodular masses when excised look like a cellular adipose lump saturated with a rather thick fluid of chocolate color, and in their centre a necrosed nucleus. According to Kopp and Chotzen, there were no bacteria found in the specimens examined by them. Under the microscope these calomel abscesses are found to contain blood, leucocytes, fatty matter and crystals of fatty acids, and the mercurial salt not yet absorbed. They are really necrotic and not septic abscesses. The fact of the absorption of the mercurial salt thus injected is proved by the prompt disappearance of syphilitic lesions and symptoms, and the demonstrable presence of mercury in the urine, fæces, and saliva. Balzer's observations, based on autopsies, go to prove that three weeks or a month are required for the absorption of the mercury.

Though it is claimed by the most ardent advocates of the calomel injections that salivation is not frequently produced, and even if developed that it is mild, according to my reading and experience this accident is not uncommon, particularly when as large a quantity as 3 grains have been injected every eight or ten days. The truth is, that one should be always on the alert and watchful of the condition of the mouth when these injections are employed. Salivation complicating this method of treatment may appear after the second or third injection, and, though rarely, even after the first. Cases are on record in which during a seemingly auspicious course of injections alarming salivation has set in. To explain this fulminating form of ptyalism the view has been expressed that the drug has had a cumulative effect, or that its absorption was slow at first, and that under unknown conditions it suddenly became very active and resulted in an explosion. Such facts carry with them their own teaching.

In the Paris hospitals, in the services of Besnier, Balzer, and Du Castel, enterorrhœa and colitis of varying degrees of severity and persistence have been observed. The imminence of these complications teaches us that we should never proceed in a bold manner in using these injections by throwing under the skin large quantities of calomel at short intervals. Cosati injected 8 grains of the salt, which caused a phlegmonous abscess, produced gangrenous stomatitis, and such a general morbid state that the patient nearly died.

Lesser[1] reports a case of mercurial erythema following a calomel

[1] "Ueber Nebenwirkungen bei Injectionen unlöshlicher Quecksilber verbindungen," *Vierteljahr. für Derm. und Syphilis*, 1888, p. 909, *et seq.*

injection. He further says that he has seen abscess less frequently follow the subcutaneous use of calomel than of yellow oxide.

Runeberg[1] reports the case of an anæmic woman, thirty-four years old, recently syphilitic, to whom three injections of $1\frac{1}{2}$ grains each of calomel were given at intervals of eight and twenty-four days, and who became so debilitated and suffered so much from diarrhœa and ulcerations of the mouth that she died. At the autopsy great destruction of the mucous membrane of the intestines and softening of the spleen were found. Vogeler[2] reports a case in which calomel injected deep into the glutei muscles produced such a severe abscess that an incision was required, together with free curetting of the walls. He further details a case in which salivation and diarrhœa, together with prostration and even collapse, were so severe that life was threatened. The patient was saved by opening the injected spots, scraping them out, and applying Paquelin's cautery. In a third case very alarming symptoms were only controlled by the adoption of this procedure.

The following case, reported by Kraus,[3] is worthy of attention: A healthy man, aged thirty years, was injected twice, with an interval of seven days, with $1\frac{1}{2}$ grains of calomel. He was soon after attacked with salivation, bloody diarrhœa, and anuria. He died on the sixth day after the last injection, and at the autopsy severe dysentery with perforation of the gut, diffuse bronchitis, parenchymatous nephritis, and ulcerative stomatitis were found. There was no urine in the bladder. Overbeck claimed that anuria is a symptom of mercurial intoxication.

Klotz[4] details a case in which, after a calomel-and-oil injection, his patient felt a sensation of heaviness in the leg near the spot injected, and was attacked with alternating chills and fever. He had severe pain in the left side of the chest, difficulty of breathing, and slight and painful cough. Examination showed a temperature of 102° Fahr. in the axilla and symptoms of pneumonia. In a few days the bad symptoms passed off. Klotz is led to think that "embolism into the lung of the oil forming part of the injected fluid had taken place." He speaks of another case in which similar phenomena, but of a milder character, were observed.

It is also well to remember the experience of Staderini[5] in the case

[1] "Quecksilber-intoxication mit toedtlichen ausgang nach subcutanen Calomel-injectionen," *Deut. med. Wochenschrift*, 1889, No. 15, p. 4, *et seq.*

[2] "Zur Behandlung der Syphilis mit subcutanen Calomel-injectionen," *Berliner klin. Wochenschrift*, 1890, No. 27, p. 940, *et seq.*

[3] "Ein Beitrag zur Kenntniss der Wirkung des Quecksilbers auf den Darm," *Deutsche med. Wochenschrift*, 1888, No. 12.

[4] "Clinical Observations on Intramuscular Injections of Insoluble Mercurial Salts in Syphilis," *Journal of Cutaneous and Genito-Urinary Diseases*, Feb., March, and April, 1890.

[5] "Injezione di calamelanos alla tempia, consequente embolia della arteria tem-

of a syphilitic man suffering from neuro-retinitis. This observer injected into the temporal region of each side of the head one gramme (15 grs.) of a 1 to 10 suspension of calomel, in order to bring the mercury as close as possible to the lesion, and thus to obtain the most active local effect. As a result, on one side a gangrenous spot was produced which laid bare the temporal artery and destroyed one of its two twigs. The author very properly calls attention to the small quantity of connective tissue in the temporal region, and to the firm, bound-down condition of the overlying integument. Injections, if used in these parts, must be made with the greatest care, and not in too large a quantity, and vessels must be avoided.

Scattered in the literature of this subject we find many claims of brilliant results and cures. Flarer by means of three injections of $1\frac{1}{2}$ grains of the salt cured a case of condylomata (gummy tumors) of the iris with posterior synechia. Scarenzio cured a case of cerebral syphilis with two injections, while iodide of potassium was taken internally. Soresina reports eight cases of specific eye diseases, such as complete paralysis of third nerve, keratitis punctata, retino-hyaloiditis, amaurosis, amblyopia, and neuro-retinitis, thus cured; while Stephanini produced brilliant results in a severe case of gummous infiltration into the pharynx. In eight cases Quaglino, by means of one, two, and three injections of 3 grains of calomel into the temporal region and arms, promptly cured paralysis of the third nerve, iritis, and keratitis punctata, retinitis, neuro-retinitis, and progressive atrophy of the optic nerves. Magri gives similar results in six similar cases, the injections being made into the temples and arms. Many other cases are to be found in medical literature in which conspicuously brilliant results have been claimed in the cure of the cerebral and ocular lesions of syphilis by Scarenzio's method. Sigmund's cures by this method were those of the mild, early manifestations of the disease, which of course readily yield to mercury administered subcutaneously, as indeed they would if the remedy had been given by the mouth. Smirnoff claims that he cured cases of tertiary syphilis, gummy tumors, tubercular, ecthymatous, and serpiginous syphilides, nocturnal pains, rheumatism, lesions of the bones, and insomnia. Other observers have failed to see benefit in the pains of syphilis, bone lesions, or insomnia. Smirnoff significantly remarks that if, during a course of injections in tertiary syphilis, aggravation of the symptoms occurs, they should be stopped at once, and that the iodide of potassium should be substituted. Klotz[1] claims very satisfactory results from calomel and yellow-oxide-of-mercury injections, administered to private patients for

porale superficiale e gangrene locale," *Bollet. del Scz. d. Cult. del Scienz med.*, 1887, 6; and *Vierteljahr. für Derm. und Syphilis*, vol. xix., 1156 and 1157.

[1] *Op. cit.*, p. 135.

primary, secondary, and tertiary lesions. It must be remembered that while patients are undergoing this method of treatment, as indeed under any form of mercurialization, they should be placed in the best possible hygienic conditions of all kinds. Though it is claimed that relapses are less frequent and less severe after this treatment than after any other, there is really no substantial evidence to prove the assertion.

It is also important to bear in mind that in old age, in cases of anæmia, of cachexia, of weak heart, of chronic visceral diseases in general, in persons having a bad state of the mouth and bad teeth, this treatment is contraindicated. Though the same ardent advocates consider it a method suitable for infants, young children, and pregnant women, I am far from their way of thinking.

From an experience of this method of treatment dating over twenty-five years (having seen the original trials of it by my colleague, Dr. Bumstead, in 1866), and from a study of all that has been written upon it, I can but reiterate what I have often said in medical debates—that it is a method of treatment of utility in emergency. It may prove useful in some cases spoken of elsewhere in this essay, such as those of ocular, aural, and cerebral syphilis, when given very cautiously and only in a few doses. That it never will be used as a systematic treatment extending over a period of years, as Neisser and Leloir suggest, I am firmly convinced. It is a treatment which is generally irksome and repulsive to patients, always attended with more or less discomfort and pain, and often producing destructive subcutaneous lesions over the body, which cause mental and physical suffering, and which of necessity must impair the patient's health and strength. In some cases, as we have seen, it has been known to imperil and to destroy life.

In the foregoing section prominent mention has not been made of the combination of calomel with oil of almonds, olive oil, or oil of vaseline. The clinical facts relating to this modification of Scarenzio's method can be more clearly and briefly brought out as an addendum to the section upon gray oil as a remedy in syphilis.

Metallic Mercury.—The administration of metallic mercury has not been extensively tried in the treatment of syphilis, and it must be confessed that the advantages claimed by those who have thus employed the agent are not conspicuously brilliant. Fürbringer[1] was, according to my reading, the first to inject metallic mercury under the skin, using the following liquid: mercury, 2 parts; mucilage acacia with glycerin, 10 parts; of which the dose is the contents of a Pravaz syringe. At the time of injection little pain is experienced, but in

[1] "Zur localen und resorptiven Wirkungweise einiger mercurialien insbesondere des subcutan injicirten Metallischen Quecksilbers," *Deut. Archiv für Klin. Med.*, 1879, 24, p. 129–157.

about twenty-four hours symptoms of inflammation appear, which may end in abscesses. If the skin is rubbed after these injections mercury may frequently be found in the urine quite early, but when simply deposited under the skin it may there remain and produce no effect. Fürbringer thinks this method of treatment should only be used when inunctions are contraindicated and when the mercurial is not well borne by the mouth. To Luton,[1] however, belongs what credit there may be in another innovation in the employment of metallic mercury in syphilitic therapeutics. This observer claims that if mercury in its pure state be injected into the muscular tissues, it will there undergo peptonization and digestion by means of the acid fluids. In a limited experience of these injections he found that syphilitic patients grew fat, and that their disease was favorably influenced.

Prokhoroff[2] states that he has thus treated forty cases, and that he considers this method of treatment superior to inunctions or to injections with any other mercurial. He injects from 6 to 30 grains (0.5 to 2.0 gm.) of the metal at a time once a week, and employs hot baths to accelerate absorption. Symptoms promptly disappeared and no toxic effects were produced. Prokhoroff thinks that the mercury traverses the system in a pure state in the form of very minute particles.

Iakovleff[3] used from 5 to 20 grains of pure mercury in weekly injections, which were followed by daily kneading and rubbing of the injected spot and by hot baths every two or three days. This author claims a minimum number of relapses in cases in which on an average $83\frac{3}{4}$ grains of metallic mercury were injected over a period of ninety-three days. The pain is said by him to be trifling, and to disappear quickly under local massage and hot baths, and indurated nodules and abscesess were not produced. Iakovleff mentions the fact that in cases previously treated by frictions mercurialism appeared after these injections.

Von Düring[4] also injected pure mercury into the buttocks of seven patients, using one-half the contents of a Pravaz syringe, more or less. When small doses were injected the effect was delayed, but large doses were promptly followed by such severe mercurial intoxication that excision of the injection-nodule in the glutei muscles was rendered necessary. In a patient injected in the forearm a movable, sharply-defined, fluctuating tumor of the size of a pigeon's egg was formed, and over it the skin was of a deep red and traversed by sinuses, through which metallic

[1] "Des Milieux hypodermiques," *Archiv. gén. de Médecine*, 1882, vol. ii. p. 526, *et seq.*

[2] *Vratch*, No. 40, 1887, p. 766.

[3] *Proceedings of the Riga Russian Med. Society*, 1889, p. 87; and *British Journal of Dermatology*, 1889, vol. i. p. 481.

[4] "Die Einwirkung des Regulinischen Quecksilbers auf tierische Gewebe," *Monatshefte für Prak. Dermatologie*, Nov., 1888, p. 1059, *et seq.*

mercury, but no pus, exuded. The microscopical examination of this mass when removed showed a picture strikingly resembling spindle-celled sarcoma. Von Düring therefore thinks that metallic mercury is unsuitable for subcutaneous injection, for the reason that small doses act too slowly, while large ones are apt to produce too intense and continuous an action. On the other hand, the following case of Augagneur seems to prove that mercury may become encysted, and from time to time be absorbed into the system. Augagneur's[1] case presented a tumor of the thigh which followed two injections of metallic mercury. A peculiarity of the case was that intermittent salivation occurred, and that on one occasion it seemed to follow a blow upon the thigh. The tumor was very large, and an incision into it down to the muscle revealed the fact that a great part of the mercury injected had not been absorbed.

Oleum Cinereum, or Gray Oil.—Oleum cinereum, or gray oil, is a semifluid, fatty, mercurial liquid introduced into medicine by Professor E. Lang of Vienna in 1886.[2] This author claimed exceptional merit for this therapeutic agent, and in his last essay,[3] after an experience of five years in its use, he states that his earlier convictions have been strongly confirmed. It is urged that this oil is well borne, and that the usual drawbacks to the use of mercury are very slight, and that even when they do occur they are mild and ephemeral in character. Lang considers this combination to be superior to mercurial frictions. Before it is used upon patients, however, he insists that the condition of their mouth and teeth shall be carefully attended to.

Gray oil is prepared as follows: A given quantity of lanoline—say 1 or 2 drachms—is rubbed up with considerable chloroform to emulsify it. This mixture is to be thoroughly triturated, during which operation the chloroform will evaporate. While, however, the mixture is still in a fluid state, metallic mercury to the amount of double the quantity of the lanoline is to be added, and the trituration further kept up. As a result, a pomade of mercury is left, which represents mercury two parts and lanoline one part. This is called strong lanoline gray ointment. From this salve-basis a 50 per cent. oleum cinereum or gray oil may be obtained by mixing three parts of it with one part of olive oil. A mild gray lanoline ointment may be made in the same manner as the strong by taking equal parts of lanoline and mercury and thoroughly mixing them. From this salve-basis a 30 per cent. gray oil may be made by mixing six parts of it with four parts of fresh almond or olive oil.

[1] "Tumeur d'origine thérapeutique de l'injection de mercure metallique," *Lyon Médical*, Mar. 30, 1890, p. 455.

[2] "Zur Syphilis-therapie," *Wien. med. Wochenschrift*, Nos. 34 and 35, 1886.

[3] "Behandlung der Syphilis mit Subkutanen Injectionen von grauen oele," *Ibid.*, Nos. 48 und 50, 1889.

Lang uses, therefore, two forms of gray oil, the one containing 50 per cent. and the other 30 per cent. of mercury. These preparations should be kept in small quantity in glass-stoppered bottles and in a cool place. With care they may be kept in perfect condition for many months.

Neisser[1] uses a modification of Lang's gray oil, made as follows: Mercury, twenty parts; ethereal tincture of benzoin, five parts; and liquid vaseline forty parts. This compound should be thoroughly triturated for a long time (care being taken that an aseptic condition is observed) until a homogeneous liquid is produced. This observer thinks that the gray oil has a large sphere of usefulness, and that it may even be used during pregnancy.

Balzer[2] and Reblaub have used Neisser's gray oil in preference to that of Lang, but were not very favorably impressed with its results. They noted pain and tumefaction after the injections into the buttocks, and that a lameness was produced which passed off after rest.

Althaus[3] has lately advocated for the treatment of syphilitic nervous affections a modification of Lang's gray oil, made as follows: Metallic mercury, one part; pure lanoline, four parts; and five parts of a 2 per cent. carbolic oil. This is said to be a homogeneous gray cream which has no tendency to decomposition. The dose is about five minims for an injection.

It is always necessary to warm the gray oil, either over a spirit-lamp or in hot water, and then thoroughly shake it before using it. Lang injects three-quarters of a grain (0.05) to one grain and a half (0.1) of the 50 per cent. solution twice in the first week in two places, and half as much the next week. Such is the claimed enduring efficacy of the remedy that Lang does not administer another injection for two or four weeks. Double the quantity of the 30 per cent. solution may also be employed. In the subsequent injections Lang is explicit in stating that they should not be made stronger, but that they may be given at various intervals, according to the urgency of the case, of one or two weeks indefinitely. It thus happens that no pause, as indicated just now, is observed, but that a continuous treatment is followed. Increased rapidity of action is produced by making injections into two spots, and a more enduring action results than from one injection of a similar quantity. Lang says that his treatment may be used according to the views of the experimenter, either continuously, by intermissions, or even symptomatically. He speaks of its efficacy in

[1] Harttung: "Die Verwendung des oleum cinereum benzoatum (Neisser) zur Syphilis-behandlung," *Vierteljahresschrift für Dermatologie und Syphilis*, 1888, p. 367, *et seq.*

[2] "Traitement de la Syphilis par les Injections intramusculaires d'huile grise benzoïnée," *Bullétin Médical*, No. 74, 1888.

[3] *The Treatment of Syphilis of the Nervous System*, London, 1891.

local and regional therapy, in cases of circumscribed infiltrations, and of ganglionic enlargement.

In the nervous affections of syphilis and the neurasthenia produced by that disease Lang claims that injections of gray oil are most efficacious, and that a notable improvement in appetite and health is soon experienced.

The sites of injections are the back, a few inches on each side of the spine, begining about the scapula and ending at the buttocks. In the regional therapy the injection should be made near the lesion to be acted upon. The injections are made into the subcutaneous connective tissues.

Certain observers, notably Hallopeau and Kaposi, have reported cases of very alarming mercurial intoxication (great asthenia and intractable colitis) as being caused by injections of the gray oil. In his latest communication Lang analyzes these cases in full, and claims that they resulted from an excessive and intemperate use of the mercurial compound, and that they should not stand as evidences of its dangerous character.

It is claimed by Lang that local pain is seldom caused by these injections, and that when it exists it is mild in characrer; also, that little if any inflammatory œdema or infiltration of the tissues is produced. In these assertions he is borne out by Trost,[1] who instituted comparative tests between gray oil and a lanoline-olive-oil combination of calomel. On the other hand, Lindstroem[2] of Kiev states that Lang's injections are slow in action, attended with relapses, accompanied and followed by pain, and frequently give rise to diffuse infiltrations. Stomatitis is frequent and severe, and accompanied by profound anæmia and diarrhœa. Lindstroem further says that these injections may give rise to embolism—that in one case he observed a consecutive paralysis of the right side of the face, and in another intense œdema of the right upper limb and pneumonia of the right side. If, now, we compare the drawbacks noted as following injections of calomel and gray oil, we may reach the conclusion that, notwithstanding all that is said in their favor, they sometimes give rise to very unpleasant symptoms, and rather exceptionally to conditions which threaten and even compromise life. Therefore, I think that their use should be restricted to well-selected cases in which other remedies are contraindicated or are impracticable of employment. When used much care and observation is required of the person who administers them. In my reading I have been struck forcibly by the fact that the most serious results have

[1] "Ueber das Oleum Cinereum im Vergleiche zur den Calomel-präparaten," *Wiener med. Wochenschrift*, 1888, No. 38, p. 1374, *et seq.*

[2] "Treatment of Syphilis by Subcutaneous Injections of Oleum Cinereum," *Meditzinskoie Obozrenië*, 1890, xxxiii. p. 7, *et seq.*

almost invariably followed injections in which fatty matters have been the vehicle of suspension. Then, besides the cases already cited, the case of Lesser[1] may be mentioned: A man, thirty-eight, had received five injections of a minute quantity of tannate of mercury in olive oil, and after the last one the patient was seized with a convulsive cough and became cyanotic. He then had diarrhœa and dulness at the base of his lung, with crepitant râles and rough breathing. He luckily escaped with his life. Therefore I think that these methods of treatment should never be largely employed as routine therapeutics.

It may be of interest to add that Watrasewski recently reported that he had made experiments upon animals which convinced him that injection of oily substances without the addition of mercury may give rise to embolism of the lung. In the section on Calomel Injections it is noted that Klotz had such an experience after a calomel-oil injection. It is certain, therefore, that there is danger in hypodermic medication when the mercurial is suspended in any other substance or liquid.[2]

Yellow Oxide of Mercury.—The yellow oxide of mercury owes its introduction into the therapeutics of syphilis to Watrasewski,[3] whose zealous advocacy of its worth has been the means of its quite extended adoption. Of all mercurial preparations, it is the salt to-day most generally used hypodermically, having largely replaced calomel. Watrasewski had used calomel on a large scale, and was led to abandon it by reason of the many drawbacks to its use (see section on Calomel), and chiefly by reason of the intense pain caused by the injection of it, and of the weakness, fever, diarrhœa, want of appetite, and insomnia which it produces. His formulæ are as follows:

No. 1. ℞.	Hydrarg. oxid. flav.,	gr. xxij;
	Acaciæ,	gr. iv;
	Aq. destillat.,	f℥j.—M.
No. 2. ℞.	Hydrarg. oxid. flav.,	gr. xv;
	Acaciæ,	gr. iv;
	Aq. destillat.,	f℥j.—M.

He begins with the second or milder solution, and injects a Pravaz syringeful. Three to six injections are sufficient for a cure, which, it must always be remembered, means, in the minds of most exploiters

[1] *Op. cit.*, pp. 913–915. [2] *Op cit.*, p. 135.

[3] "Ueber Behandlung der Syphilis mit Injektionen von Kalomel und Quecksilbersoxyden," *Wiener med. Presse*, 1886, Nos. 42 and 44; "Ueber die Behandlung der Syphilis mit Injektionen unlœslicher Quecksilber-Salze," *Monatshefte für Prak. Dermatologie*, 1887, p. 989, *et seq.*; "Étude comparative sur l'Effet thérapeutique des Injections mercurielles insolubles dans la Syphilis et sur les Accidents qui peuvent accompagner leur emploi," *Journal des Mal. cutanées et syphilitiques*, 1890, vol. i. p. 193, *et seq.*

of hypodermic mercurial preparations in syphilis, the disappearance of a given set of symptoms or lesions.

The yellow oxide of mercury is promptly absorbed, and its presence can be detected in the urine within a day or two. It seems to linger in the system also, and whereas many of the mercurial preparations soon disappear from the urine upon the cessation of the injections, when the yellow oxide is discontinued mercury, according to several observers, may be found in the urine for three weeks or more. The usual claims are made by Watrasewski as to the prompt action, the mild and ephemeral local reactions, and the comparatively rare occurrence of mouth and intestinal complications after injections of yellow oxide.

Many observers have used Watrasewski's salt, and speak in high terms of it, among them Dr. Klotz of New York.[1] Rosenthal[2] endorses its use quite warmly, and considers it next to inunctions in value. This observer used the following formula:

℞. Hydrarg. oxid. flav.,	gr. vij;
Ol. amygdal. vel olivæ,	f℥ss.—M.

Of this the dose is 30 minims, injected every eight days into the glutei muscles.

Kuhn[3] put this agent to the test in comparison with calomel. He concludes that it is less active than that salt, but has the advantage of being less painful, of causing mild and ephemeral indurations, and being attended with no local or constitutional complications. Tchernogüboff[4] employed the yellow oxide, using one or two injections of 2 grains each, into the cellular tissues in early cases, at intervals of eleven days, and in older cases at longer periods. This observer, as will be seen, uses large doses, and says that they are beneficial in tertiary syphilis and in early gummata. Men and women, it is claimed, bear these large doses well, and children are said to be benefited by doses of 1 grain. Tchernogüboff thinks this remedy is contraindicated in anæmia, exhaustion, alcoholism, and visceral diseases. Perhaps it may be well to add that any mercurial preparation should be used with great caution in patients suffering from these grave disorders.

Tchernogüboff[5] also uses this preparation in doses of 2 grains

[1] *Op. cit.*, p. 99.

[2] "Die Behandlung der Syphilis mittelst Einspritzung, von Hydrarg. oxyd flav," *Vierteljah. für Derm. und Syphilis*, 1887, p. 1101, *et seq.*; and "Allgemeine Gesichtspunkte bei der Behandlung der Syphilis mittelst Quecksilbereinspritzungen, *Ibid.*, p. 1107, *et seq.*

[3] "Zur Behandlung der Syphilis mit Injektionen von Hydrarg-oxyd-flav. im Vergleiche züm Calomelöl," *Deut. med. Wochenschrift*, 1888, p. 635, *et seq.*

[4] *Lancet*, Oct. 12, 1887, p. 757.

[5] *Transactions of the Third General Meeting of Russian Medical Men*, No. 5, p. 160, St. Petersburg, 1889.

every ten or eleven days, injected into the muscles. He says that syphilitic children from twelve to fourteen years old tolerate one-grain doses hypodermically very well, and are benefited. He thus treated 120 cases, male and female, young and old, without any untoward complications. It is interesting to remember that Lesser[1] observed abdominal pains, vomiting, and bloody and mucoid diarrhœa after injections of yellow oxide, and never after calomel. The conclusion, therefore, is warranted that we can only get at the truth as regards the the advantages and drawbacks peculiar to any and all preparations by a study of the experience of many men. It is never well to rely fully upon the assertions of the exploiter of a new mercurial preparation or combination. Thus we find that Dampekoff[2] used the yellow oxide upon 179 syphilitic women, and that neither intense pain nor suppuration was produced. Yet these women absolutely refused to allow the continuation of the treatment by reason of the severity of the pain. Then, on the other hand, Reshetnikoff,[3] in the course of 1800 injections of yellow oxide suspended in vaseline oil and made into the gluteal regions, never met with an instance of local suppuration, and only once saw a diffuse sanguinolent infiltration, which disappeared without any bad result. A quite recent essay on the value of yellow oxide of mercury hypodermically in syphilis is contributed by Selenew,[4] of Stükovenkoff's clinic in Kiew. This observer reaches the conclusion that this treatment is to be preferred to all others as offering a more energetic and more prolonged influence of the mercurial upon the syphilitic virus. Selenew thinks that cerebral lesions, old age, exhaustion, anæmia, and alcoholism are not contraindicating conditions to its use. He noted a mild character in the sequelæ of the injections, and occasionally a mild and ephemeral rise in the temperature.

My own conclusion as to this agent is that in certain exceptional cases, where regional or local mercurial therapy is required, it may be, if used carefully, of decided benefit. I have no leaning to the routine use of any insoluble salt of mercury employed hypodermically.

Many other contributions upon the use of the yellow oxide of mercury have been published, but they contain nothing more than has been here presented.

Black Oxide of Mercury.—Black oxide of mercury, used largely in homœopathic practice, has been extolled as a remedy for

[1] *Op. cit.*

[2] *Dnevnik Kazanskaho Obshtchestva Vratchei*, Jan. and May, 1889, p. 11; and *British Journal of Dermatology*, vol. i., 1889, p. 381.

[3] *Vestnik Obshtch. High. Südebnoi i Praktitcheskoi Meditziny*, Jan., 1889, p. 1–17; and *British Journal of Dermatology*, vol. i., 1889, p. 349.

[4] *Meditzinskoie Obozreniё*, 1890, p. 1; and *British Journal of Dermatology*, vol. ii. p. 190.

syphilis when administered subcutaneously. Abend[1] used a suspension of this drug in gum and water, employing in all six hundred and eighty-three intramuscular injections, of which two to fourteen are necessary in each case. He noted the early disappearance of secondary and tertiary lesions. Pain and infiltration were moderate, there were no abscesses, and rarely was stomatitis observed.

Hartmann[2] also claims for the black oxide especial advantages. He used the following formula:

℞. Hydrarg. oxidi nigri, gr. xv;
Glycerini,
Aquæ destillat., āā. fʒiss.—M.

Of this the contents of a Pravaz syringe should be injected into the buttocks.

Hartmann also uses a 10 per cent. oil emulsion. Three to six injections are considered sufficient. They produce some pain, slight irritation, and sometimes stomatitis. It is claimed that this drug is indicated in the treatment of hereditary syphilis.

Watrasewski also used both black and red oxides of mercury in a 10 per cent. gum solution. He found that they exhibited considerable action, comparable to that of calomel, but that they caused less pain than that drug. He thinks that the oxides mix more readily with liquids than calomel. The resulting nodosities are smaller and less lasting than those produced by calomel.

It need only be mentioned that protoiodide of mercury, tannate of mercury, red oxide of mercury, sulphate of mercury, and turpeth mineral have all been tried hypodermically in syphilis, and their promoters have usually found them efficacious. The truth is, that they all come under the head of insoluble salts, and none of them possess any advantage whatever over calomel, while some are more irritating and others less efficient.

Cinnabar.—Cinnabar (hydrargyrum sulphuratum rubrum) is considered by Dr. A. A. Sükhoff of Cronstadt the best mercurial preparation for subcutaneous use. He prefers the so-called artificial cinnabar, a fine bright-red salt, which mixes very evenly with oil of sweet almond. One drachm of the powder is mixed with an ounce of oil of sweet almond, and of this one syringeful, representing about one and a half grains of the agent, is injected into each buttock every one or two weeks. The average number of injections required varies between two and ten, and the sojourn of the patients in the hospital averaged between

[1] "Behandlung der Syphilis durch Subcutanen Injectionen von Hydrargyrum oxydulatum nigrum," *Inaugural Dissertation*, Würzburg, 1887.

[2] "Behandlung der Syphilis mit Injectionen von Hydrarg. oxydulatum nigrum," *St. Petersburg med. Wochen.*, 1890, 3.

twelve and forty days. Sükhoff[1] claims that these injections are painless, and cause no local or general reaction, and that they are suitable for ambulatory cases. He makes the significant remark that in rare malignant forms of syphilis this agent is less energetic than the classical mercurials.

Corrosive Sublimate.—Though Hebra[2] in 1861 employed hypodermic injections of corrosive sublimate upon two cases of syphilis, and Berkeley Hill[3] in 1866 upon eleven cases, it was not until after the appearance of the monograph of Lewin[4] of Berlin upon the subject that this mode of treatment took a prominent place in the therapeutics of syphilis. The first important contribution to this subject published in France was by Liégois,[5] and after this very many articles appeared in various countries detailing the experience, favorable or the reverse, of different observers. In 1871, I published the results of my experience[6] in the treatment of 50 cases of syphilis by this method, and I have employed it since within the limitations yet to be brought out. From the experience of many observers it is made clear that doses of from $\frac{1}{12}$ to $\frac{1}{4}$ of a grain of this salt, dissolved in from 10 to 15 drops of distilled water, injected into the subcutaneous tissues, have a prompt effect upon secondary syphilitic manifestations. Whereas in earlier days the claim was made that this treatment was applicable to all forms and stages of syphilis, the conviction has gradually gained ground that it is a method (valuable in very many instances) of reserve, emergency, utility, or expediency. Thus in cases in which mercury is badly borne by the stomach, and by that method acts as a depressant and impairs nutrition, it is very common to observe that these injections are well borne, and that an era of improvement is inaugurated. Again, in cases of intestinal disorder, in which pain and diarrhœa always follow the stomach-dose, the subcutaneous injections come to our aid. In many cases when by stomach ingestion a mild or severe stomatitis or salivation is produced, or when local medication is powerless, the substitution of hypodermic injections will often be followed by full toleration of the drug. The injections are often of much value in local and regional therapy, as, for instance, in

[1] "Treatment of Syphilis by Injection of Cinnabar," *Protok. Rusch. Sif i Dermat. Obst. St. Petersburgh*, 1890, iv. 51–57.

[2] "Ueber die Behandlung der Syphilis," *Allgemeine Wiener med. Zeitung*, July 23, No. 30, 1861.

[3] "Subcutaneous Injection of Mercury in Syphilis," *Lancet*, May, 1866.

[4] *Behandlung der Syphilis mit subcutanen Sublimat-injectionen*, Berlin, 1869.

[5] "Des Resultats cliniques et scientifiques obtenus avec les Injections sous-cutanées de sublimé a petites doses," *Annales de Dermat. et de Syphilographie*, tome 2, 1869–70, pp. 1, 90, and 272.

[6] "On the Treatment of Syphilis by the Hypodermic Injection of Corrosive Sublimate," *Medical Gazette*, May 13, 1871.

cases of localized syphilitic neoplasms, resisting internal treatment, in eye, ear, and cerebral affections, and hyperplasia of the lymphatics and the ganglia. In the past two winters I have often derived much benefit from the hypodermic injection of corrosive sublimate in patients who were suffering from the grip, and in whom the secondary manifestations of syphilis coincidently showed themselves. In many of these cases mercury by the stomach was badly borne and produced debility and great nervousness; in others the stomach was fully taxed by the antigrip remedies; and in still others it seemed to have no effect. In these conditions I resorted to the sublimate injections, with a promptly beneficial effect and ultimate good results upon the syphilitic diathesis. It is well to bear these facts in mind, for they will be the means of helping many a sorely-tried patient over some very rough spots.

In many cases of secondary syphilis it will happen that by reason of colds, of intercurrent late acute affections of the lungs, liver, and intestines, and of gastric derangements, mercury by the mouth is temporarily contraindicated; and in these exigencies a resort may be had to hypodermic medication. Patients sometimes become tired and complain of the dosing by pills, and circumstances do not favor the use of inunctions or fumigations; and in these cases very often quiet and contentment may be produced by using the mercury subcutaneously. In some cases, happily rare, the evolution of the secondary period of syphilis is ushered in with fever and deep debility; in fact, a pseudo-typhoid state is produced (*typhose-syphilitique* of Fournier). In such cases there is very often stomach intolerance of mercury, and the patient is too weak to stand mercurial inunctions. In this emergency we can use hypodermic injections of sublimate with confidence, and employ the stomach for symptomatic remedies. Even at this late day I think I can do no better than quote in the main the conclusions—somewhat modified and elaborated, however—which I reached upon this subject in 1871. They are as follows:

1. That the use of bichloride of mercury by hypodermic injections, though a method of treatment possessing certain advantages, is for various reasons of limited application. 2. It is useful in the whole secondary period of syphilis, in roseola, in the papular syphilides, and in the small miliary pustular syphilide. Its action upon newly-appearing syphilides is sometimes almost marvellous. This effect is always strikingly well marked upon lesions in the vicinity of the injections, which disappear in a few days Thus in cases of disfiguring and compromising syphilitic eruptions on the face, neck, or hands, these injections, made as near as possible to the seat of the lesions, will always bring about a prompt and satisfactory result. When syphilides have grown old, they are often slow to yield to these injections, which have little if any effect upon scaling lesions, whether of early or late

evolution. 3. It very rapidly cures all syphilitic neuroses, cephalalgias, pleurodynias, and angina, even when they are slow to yield to the internal use of mercury and morphine. 4. In the cachexias of syphilis, early and late, and in the anæmia with concomitant gastric weakness, these injections, used for a time as a treatment of utility, will prove very efficacious. 5. It possesses no advantages over other methods in the treatment of mucous patches and condylomata lata, or in the hard œdema accompanying primary or secondary lesions. 6. It may be beneficial in the mild and even severe forms of cerebral and spinal lesions, in combination with iodide of potasssium internally, particularly in those cases in which the use of mercurial frictions is for any reason impossible. Under like conditions in eye and ear syphilis these injections may be resorted to. 7. In the early tertiary lesions, and even in the late forms if not of an ulcerated character, these injections are often beneficial, but they then require the internal use of the iodide of potassium as an adjuvant. 8. This treatment is frequently well borne by men, but is much objected to by women as a rule, and in children and infants it is contraindicated except under conditions of severe emergency.

Rosolimos,[1] who has used sublimate injections upon a large scale, calls attention to a fact which I have also observed—namely, that the method is often extremely efficacious in cases of buccal lesions without the aid of topical treatment. He attributes this efficient action not only to the curative influence of the injections, but also to the fact that they very rarely, if ever, cause stomatitis or any form of mouth lesions, which so often lead to the development of syphilitic processes on these parts.

It is of the utmost importance that the patient should be not only intelligent, but at the same time impressed with the gravity of his disease, in order that he may comprehend the advantages he is to derive, otherwise he will not submit to the pain and inconveniences of the treatment. In some cases in private practice the treatment is inadmissible by reason of the cost of the frequent injections. In dispensary practice patients soon tire of this treatment, and they fail to appear for its continuance. It is well, therefore, for physicians not to put down in their records cases as being cured for the reason that they did not come back, since it is very probable that they may have sought other and more agreeable methods of treatment.

Within the limits of expediency, emergency, and utility these injections possess the advantages of smallness and precision of dose and ease of administration, a promptly satisfactory therapeutic action, and the absence of systemic disturbance.

[1] "Les Syphilides secondaires de la Bouche, traitées par les Injections mercurielles," *Annales de Derm. et de Syph.*, 1888, p. 525, *et seq.*

The quantity of mercury for initial injections should be about $\frac{1}{10}$ or $\frac{1}{8}$ of a grain of the sublimate for persons in good health. In weakly individuals $\frac{1}{12}$ of a grain may be used. Therefore it is well to have several solutions on hand, always in small quantity, kept in a cool place and secluded from the light. After many years' experience I have reached the conclusion that 10 or 12 drops of water are sufficient for the amount of injection fluid. Thus we may have a solution in which $\frac{1}{10}$ of a grain of sublimate is dissolved in 10 drops of water, another of $\frac{1}{8}$ of a grain in the same quantity, and for exceptional instances $\frac{1}{6}$ or $\frac{1}{4}$ of a grain to the same amount. As a rule, it will be found that as an all-around solution the one containing $\frac{1}{8}$ grain to 10 drops will be the most used and the most effective. For a few injections a greater strength may be required by reason of emergency or the severity of symptoms, and in most instances benefit will result. These solutions must be made with great care and with distilled water, and then they should be filtered. Whenever they show signs of turbidity they should be rejected.

White[1] of Guy's Hospital has recently reported his success in the treatment of syphilis of the nervous system with the sublimate injection. He first injects deeply into the gluteal muscles $\frac{1}{8}$ of a grain of muriate of morphine, then, withdrawing and recharging the syringe, he injects $\frac{1}{8}$ of a grain of the mercurial. He speaks of one case in which daily injections for nearly ten weeks were made. In this connection it should be remembered that by such a treatment we are liable to induce a craving for morphine. It is always better for the patient to stand the pain.

Cruyl[2] has modified the use of sublimate hypodermically by using olive oil as the means of suspension. A given quantity of sublimate is dissolved in ether, and then incorporated with the oil. The dose is the same as in watery solutions. No bad effects are produced by these injections.

A further modification of the sublimate treatment is in the form of emulsion with vaseline oil, which Tchistiakoff[3] considers very valuable in severe cases, and not attended with bad results. This same observer has made a number of experiments[4] in order to find a combination with sublimate which does not give rise to pain, and concludes that the following combination answers the purpose well:

[1] "On the Treatment of Syphilis, especially of the nervous system, by the Subcutaneous Injection of Perchloride of Mercury," *Lancet*, June 6, 1891.

[2] "Une Nouvelle Injection mercurielle sous cutanée," *Annales de Dermat. et de Syphilographie*, 1890, p. 35.

[3] *Transactions of the Third General Meeting of Russian Med. Men in St. Petersburgh*, 1889, No. 5, p. 158.

[4] *Voënno-Meditzinsky Jürnal*, No. 28, 1889, p. 456.

℞. Hydrarg. chlorid. corros.,	gr. x ;
Aquæ destillat.,	℥j ;
Acidi tartarici,	ʒss.—M.

The syringe should be made of India-rubber, and should hold 10 or 12 drops, or if larger should be accurately gauged for those amounts. The needles should be of very fine calibre, of steel, and fully an inch and one-eighth or one-quarter long. The greatest care should be taken to keep the syringe and needles (for it is well to have quite a number) in a state of perfect cleanliness and removed from any chance of dust contamination. When the syringe is charged with the sublimate solution and the needle is affixed, the instrument should be placed in a saucer or tray containing a 5 per cent. carbolic solution. In the operation the utmost asepsis should be aimed at, and the injected part should be carefully washed with soap and water, and after that sopped and wiped with carbolic water (5 per cent.). The skin being pinched up in a fold, the needle is to be pushed gently, slowly, but firmly deep into the subcutaneous connective tissues, and then the fluid is to be expelled slowly and with care, in order that the tissues may not be bruised more than necessary. Slight massage over the injection will aid in its diffusion into the tissues. It must always be borne in mind that the fluid should not be thrown into the deep parts of the derma proper, for the reason that if there deposited it is very prone to produce an eschar, which will result in the destruction of the whole thickness of the skin. Then, again, great care must be exercised that the point of the needle is not lodged in a vein, in which case dizziness, syncope, a feeling of suffocation, pain in the heart and lungs, and other alarming symptoms will be observed. To avoid this accident the surgeon must watch the piston of the syringe while he is injecting. If there is a moderate but mild resistance to the injected fluid, as will be the case if the tip is in the subcutaneous tissues, he may know that he is all right. If, however, the injection seems to pass out of the syringe without any or with very little resistance, there is fear that the tip is in a vein. Under these circumstances it is well to push down farther or withdraw the needle a little until the normal resistance shall be felt and no untoward symptoms threaten. A very moderate amount of practice in the use of hypodermic injections will teach the surgeon to know when he is in danger of doing harm.

Various—indeed almost all—parts of the body have been selected for this method of treatment. The arms and legs have been used and abandoned, for the reason that much discomfort, pain, and muscular inability is generally produced. The back in a line from the shoulders to the hips, at a distance of about six inches on either side of the spinal column, was utilized by Lewin, and may occasionally be used when

other parts fail to offer a proper site for injections. It is always important, when using any form of subcutaneous injection of mercury, to avoid parts liable to be compressed over bony ridges or prominences or where extra pressure of the garments is exerted. After many years' experience I have come to look upon the gluteal regions as the most advantageous sites for mercurial injections. Smirnoff first called attention to the depressions just behind the great trochanters as eligible sites for injections, and I think that no parts of the body lend themselves to our purpose as well as these. Injections made here, as a rule, cause little if any pain and but small and ephemeral nodosities. In this region quite a number of injections may be given, and in most instances sufficient surface is offered for the requisite injection-treatment. We can resort also to the hypogastric regions and to the parts near the inguinal lymphatics, above and below; but whenever the upper parts of the thighs are used great care must be exercised, and the injections tried in a tentative manner in order to determine whether we can continue them or not. As it is very often important to act locally upon lesions of the penis and of the lymphatics arising therefrom, we may have to utilize the tissues in their vicinity. It must always be remembered that injections should not be made into the mons veneris or under the skin of the penis. The region of the neck, particularly its back portions, may be used in some extreme cases requiring local or regional therapy. Care must be exercised that vessels and nerves are not punctured or injured. Whenever mercurial injections are employed for localized deposits or new growths, the anatomical peculiarities of the parts must be taken into consideration.

As a rule, the injection of $\frac{1}{8}$ or $\frac{1}{6}$ of a grain of sublimate every second day will be attended with no bad or annoying results, and even a daily injection may be well borne and may produce good results. No absolute rule can be given as to the dose or its frequency: as has already been said, each case is a problem, and when treated with these injections, as with all methods of antisyphilitic therapy, must be carefully watched. If the general condition of the patient is improved, if his lesions show signs of yielding to treatment, and if the annoyances and discomforts of his disease are ameliorated, the physician may be assured that he is on the right track, and he can increase the dose or the frequency of the injections according to the indications presented. It is astonishing how seldom stomatitis or intestinal troubles are produced even when massive doses of the sublimate are injected.

The unpleasant local effects are as follows: Pain at the point of puncture; pain at the site of the injection; an erythematous condition of the skin, with heat and itching or burning; infiltration in the subcutaneous tissues and localized firm nodosities.

The pain at the point of puncture is usually trifling, and is seldom seen in this era of asepsis.

The pain at the site of the injection may be severe, and even lasting in some few instances, but as a rule it ceases in a few hours. It may last one or more days, and give way to a sensation of tenderness and soreness of varying degrees. In many cases it will be observed that pain is felt after the first few injections, and that thereafter it is not complained of. The temperament of the patient in this ordeal, as in disease in general, has much to do with the presence or absence of pain following injections.

An erythematous halo of greater or less extent may often be observed even when the utmost care has been taken with the injection. As a rule, this hyperæmia is slight and ephemeral, and causes little annoyance. In some cases the redness is deep and the burning and itching are severe. It is a condition readily cured by rest and cooling lotions.

Infiltration into the subcutaneous tissues may be of various grades of severity. In somewhat exceptional cases it presents many of the objective features of erythema nodosum. We may also find more or less extensive induration of a brawny character, which may be painful or the reverse. In some instances prompt involution occurs, and in others the thickened condition is very persistent, so that patients present large surfaces of skin the seat of brawny swelling and thickening. The nodosities are usually the sequelæ of diffuse infiltrations. In some cases each injection gives rise to a localized marginated subcutaneous tumor which presents a feeling of firm structure. These nodosities remain in an indolent condition for a time, and then disappear.

In the sense in which we understand the abscesses which follow calomel injections, it may be said that these complications are not observed in sublimate injections. During more than twenty years I have seen but two, or perhaps three, subcutaneous abscesses. They are certainly of great rarity. I have seen in my own practice and in that of another surgeon a localized gangrene of the skin occur in consequence of the injection not having been thrown into the subcutaneous tissues, but rather into the deep parts of the derma. In these cases the entire skin, for an area corresponding to the extent of the injection, is killed. The process of decay is a rather slow one, and the morbid tissue is thrown off and a clearly punched-out wound is left. With ordinary care this troublesome accident may be avoided.

Sal alembroth, the double chloride of mercury and ammonium, was introduced into the therapeutics of syphilis by Bloxam[1] of London as

[1] "On the Intramuscular Injection of Mercury in Syphilis," *Lancet*, April 28, 1888; and "On Syphilis and its Treatment," *Ibid.*, May 5, 1888.

being preferable to all other mercurial preparations for hypodermic use. The solution found by the author most efficient was one which did not contain an excess of chloride of ammonium, and was made by dissolving 32 grains of sublimate and 16 of chloride of ammonium in sufficient water to make 2 ounces. The dose of this solution, which is not liable to decompose, is 10 minims, and it should be injected deep into the glutei muscles once a week. By this agent the author claims that he has been very successful in the treatment of syphilis, using the injections weekly, bimonthly, and monthly for a period of eighteen or twenty-three months.

Composite Preparations of Mercury.—Early in the history of sublimate injections efforts were made to obtain a salt or a combination which should be so bland as to cause no pain or irritation, and which would be more promptly absorbed and readily assimilated than the bichloride. The search for this panacea began in 1871, and it still continues. To Staub[1] may be given the credit of first proposing a chloro-albuminous solution of mercury. He used the following formula:

℞. Hydrarg. bichlor., gr. xx;
Ammon. chlor., gr. xx;
Sodii chlor., ʒj;
Liquor. ovi albi,
Aquæ destillat., āā. fʒiv.—M.
Sig. Inject 20 minims at a dose.

Staub's fluid was not used largely, even in France, where the bichloride solution was preferred. In 1876, Professor Bamberger[2] introduced an albuminous mercuric compound which was largely used, and is even employed at this time. Bamberger's solution is made as follows: To 100 c. c. of a filtered solution of white of egg (containing 40 c. c. of albumin and 60 c. c. of water) there are added 60 c. c. of a solution of mercuric chloride (containing 5 per cent. or 3 grm. Hyd. Cl_2) and 60 c. c. of a solution of sodium chloride (containing 20 per cent.); finally, 80 grm. of distilled water are added, which brings the bulk of the solution up to 300, containing 0.010 sublimate in every cubic centimetre. Upon the hypothesis that in stomach ingestion sublimate is first converted into an albuminate, which in its turn is readily absorbed, Bamberger's fluid was accorded an extensive use in Germany. But by reason of the more or less prompt deteriora-

[1] *Traitement de la Syphilis par les Injections hypodermique de Sublimé à l état de Solution chloro-albumineuse*, Paris, 1872.

[2] "Ueber Hypodermatische Anwendung von löslichen Quecksilber-albuminat," *Wiener med. Wochenschrift*, No. 11, 1876; and "Nachträgliche Bermerkung über die darstellung des löslichen Quecksilber-albuminat," *Ibid.*

tion of this fluid (in its becoming turbid and precipitating a white substance consisting chiefly of calomel) it gradually fell into disfavor—a result which was accelerated by the fact that its injection produced nearly if not as much pain as the sublimate injections. I used this solution in many cases over a considerable period of time, and abandoned it by reason of the uncertainty of the dosage from precipitation, and from the fact that it possessed no advantage over the sublimate solution. My colleague, the late Dr. Bumstead, reached a similar conclusion.

With the death of the mercuric albuminate, phœnix-like a new preparation was heralded. For this therapeutic novelty the world is indebted to the late L. Martineau [1] of Paris, who in season and out of season, wrote in journals and in societies spoke words of praise about his *peptone mecurique ammonique.* According to this enthusiastic physician, the syphilitic panacea had at last been found, which was readily absorbed, caused no pain or inconvenience, and cured promptly every case. The formula of the preparation is as follows:

℞. Hydrarg. bichlor.,	ʒiiss;
Pepton (Catillon),	℥ss;
Ammon. chlor.,	℥ss.—M.

Fifteen grains of this preparation contain 4 grains of sublimate. It was diluted in water alone and in a mixture of water and glycerin, and was injected in doses of from $\frac{1}{7}$ of a grain upward. Though so much vaunted, the preparation was not largely used, and since the death of its introducer it has passed into the limbo of therapeutical curiosities.

A number of observers have also published papers on peptone-mercury in various forms and modifications in syphilis. Though numerous, these essays contain nothing worth recording, and they themselves may well be speedily forgotten.

Hydrochloric Glutin-Peptone Sublimate.—This newly-elaborated compound has been recently much praised by Hüfler,[2] who contends in favor of soluble preparations of mercury for hypodermic use in syphilis. In Strümpell's clinic sixty patients were treated by this new compound. It is claimed by Hüfler that the remedy is prompt and efficient, that it causes no local reaction, and that relapses are no more frequent than when other treatments are followed. It may be remarked that such polypharmaceutic refinements as the one just mentioned should

[1] "Des Injections sous cutanées de Peptone mercurique Ammonique dans le Traitement de la Syphilis," *Union médicale,* 1881, 3d series, vol. xxxiii., pp. 97, 125, 136, 149, 174, and 186; and "Leçons sur la Thérapeutique de la Syphilis," *La France médicale,* 1882, tome 2, Nos. 17 to 34.

[2] "Ueber die Behandlung der Syphilis mit Salzsauren Glutinpeptone Sublimat (nach Dr. Paal)," *Therap. Monatshefte,* Sept., 1890, p. 437, *et seq.*

be looked upon only as therapeutical curiosities, to be used by those seeking novelty rather than true scientific results. This preparation is said to have been patented by its inventor, Dr. Paal. It is scarcely probable that he will be annoyed with the prosecution of many infringement suits.

Bockhart[1] introduced into medicine a preparation which he calls blood-serum mercury, which he thinks is better than any other combination of mercury and albumin. It is, he claims, of fixed composition, and when injected under the skin causes little if any pain or inconvenience, even when injected into the thighs. It is prepared as follows from the blood of sheep, horses, or oxen: $10\frac{1}{2}$ drachms of blood-serum, sterilized after Koch's method, are placed in a graduated glass, and then mixed with a solution of 45 grains of bichloride of mercury dissolved in 1 ounce of boiling distilled water. The precipitate formed is redissolved by the addition of 105 grains of chloride of sodium dissolved in 5 drachms of distilled water. This compound is then a 3 per cent. solution of blood-serum mercury. By adding enough distilled water to make the whole measure 6 fluid ounces and 5 drachms, we have the solution generally used, containing $1\frac{1}{2}$ per cent. of the mercurial salt. In every detail of preparation the most scrupulous care must be taken to preserve an aseptic condition. Fifteen minims of this solution contain $\frac{1}{4}$ of a grain of sublimate combined with albumin. Injections should be made daily or every second day. This liquid is of a yellowish opalescent color, and shows little tendency to decomposition if kept in a dark bottle in a cool place.

Bockhart employed this preparation in many cases of early syphilis, of condylomata, gumma of the tongue, gumma of the skin, of syphilitic ozæna, and of scaling syphilitic eruptions of the palm, and found excellent results. Lipp, however, thinks that the remedy is less efficacious and more painful and uncertain in its action than the utterances of Bockhart would lead us to expect. Hallopeau[2] says that the experiments made with this preparation at the Hôpital St. Louis did not realize his expectations. All the patients thus treated complained so bitterly of the pain produced that the remedy was of necessity given up. Rona,[3] on the other hand, though he concedes that the remedy has some drawbacks in the way of local and general reaction, thinks that it is a valuable one and worthy of trial.

Cyanide of Mercury was brought prominently forward by the late Tilbury Fox[4] as a very efficient and satisfactory preparation in the

[1] "Blut-serum-Quecksilber, ein neues präparat zur Injections-behandlung der Syphilis," *Monatshefte für Praktische Dermatologie*, 1885, No. 5, pp. 137, *et seq.*

[2] *Revue des Sciences médicales*, vol. xxvii. 1886, p. 241.

[3] "Blut serum Quecksilber (Bockhart) gegen Lues," *Monatshefte für Prakt. Dermat.*, June, 1886, p. 287, *et seq.*

[4] *Skin Diseases*, London, 1873, pp. 306 and 307.

treatment of syphilis; and it has again recently been advocated as a most excellent antiseptic by Chibret.[1] Fox employed it in the form of pills, with the initial dose of $\frac{1}{20}$ of a grain thrice daily. This agent was first employed by the hypodermic method by Cullingworth,[2] who reached the conclusion that it was superior to the sublimate by reason of the mildness of pain and of local reaction, and of its stability in solution. Therapeutically, he found it very efficient, and employed the following formula:

℞. Hydrarg. bicyanidi, gr. xij;
Glycerini, f℥ss;
Aquæ destillat., q. s. ad f℥iv.—M.

The medium dose was 10 drops ($\frac{1}{18}$ grain), injected every day, but double the quantity can be used in appropriate cases under careful surveillance.

This agent was not extensively adopted as an antisyphilitic remedy, and little was then heard of it until the year 1876, when Sigmund[3] praised it, and placed it next to sublimate and calomel in its potency. This observer regarded it as beneficial in mild cases, and noticeable for its slight disturbance of the tissues after injections. Sigmund's opinion was endorsed by Mandelbaum[4] of Odessa, who regarded it as a good remedy in public practice for many reasons, particularly its cheapness. It would seem that in Mandelbaum's experience this agent causes pain, for he has since published a formula which contains cocaine, as follows:

℞. Cocaini muriat., gr. j;
Hydrarg. bicyanidi, gr. $\frac{1}{6}$;
Aquæ destillat., ♏ xv.—M.

This quantity is sufficient for one injection.

As showing how one man's experience in the use of a drug is diametrically opposed to that of another, it is interesting to give the views of Güntz[5] of Dresden upon the effects of the cyanide hypodermically

[1] "Étude comparative des pouvoirs Antiseptiques du Cyanure de Mercure, et cet.," *Compt. rendus Acad. des Sciences*, Paris, 1888, cvii. 119.

[2] "On the Subcutaneous Injection of Mercury," *Lancet*, vol. i., 1874, May 9, 16, and 23.

[3] *Ueber Neuere Behandlungsweisen der Syphilis*, Vienna, 1876; and *Vorlesungen Ueber Neuere Behandlungsweisen der Syphilis*, Vienna, 1880.

[4] "Ueber die Behandlung der Syphilis mit Subcutanen Injectionen von Bicyanuretum Hydrargyri," *Vierteljahr. für Derm. und Syphilis*, 1878, 201, *et seq.*; and "Kokain als Schmerzstillendes Mittel bei der Hypodermatischen Syphilis Behandlung," *Monatshefte für Prakt. Dermat.*, vol. vi. p. 241, *et seq.*

[5] "Ueber Subkutane Injektionen von Bicyanuretum Hydrargyri bei Syphilitischen Erkrankungen," *Wien. med. Presse*, 1880, xxi. pp. 563, 598.

used. This observer says that the solution is very unstable and should be used up quickly, and that its use causes much pain, vertigo, noises in the ears, nausea, and syncope. It is very probable that he selected for his injections places which are particularly sensitive, and that when he observed syncope, etc., these alarming symptoms were due to the fluid being injected directly into a vein. Güntz convinced himself of the very rapid action of the remedy, and that by its hypodermic use salivation might be induced. The infiltration of the skin was less than after the employment of the bichloride.

Cyanide of mercury was first used in syphilitic eye affections by Galezowski,[1] who injected from 5 to 10, and even 15, milligrammes in men. The author reports cures in seven cases of iritis with interstitial infiltration into the cornea, iritis and condylomata, iritis and keratitis punctata, irido-choroiditis, interstitial keratitis, and neuro-retinitis. Isolated cases in support of Galezowski's claims have appeared from time to time in medical journals.

It is needless to mention a number of papers published within the last ten years upon the therapeutic effects of this drug, since they all, in the main, endorse what has already been said. The most important recent paper is by Boer[2] of Berlin, who used the cyanide upon thirty cases of syphilis in men and women, and who thinks that it has an antibacterial action. Besides its promptness of action and mild local irritating effect, Boer thinks the cyanide beneficial for the following reasons: 1, it does not coagulate albumen, and has a neutral or alkaline reaction; 2, it is less irritating than sublimate; 3, and does not become decomposed by light.

Iodo-Tannate of Mercury was prepared by Nourry[3] with the idea of obtaining a preparation to which the stomach is not intolerant. Dujardin-Beaumetz, who tried this salt in practice, thinks that it fulfils the hopes of its inventor. It is used hypodermically in the following solution:

℞. Hydrargyri,	gr. $\frac{1}{8}$;
Iodini,	gr. $\frac{1}{2}$;
Acid. tannic.,	gr. $\frac{3}{5}$;
Glycerini,	♏xv.—M.

This quantity is said to be rather too large, and liable to produce salivation, therefore but half of it should be used.

[1] "Des Injections hypodermiques du Cyanure de Mercure dans la Syphilis oculaire," *Progrès médical*, April 15, 1862, p. 279, *et seq.*

[2] "Injectionen von Quecksilber Oxycyanid gegen Syphilis," *Therapeut. Monatshefte*, 1890, p. 332, *et seq.*

[3] "Sur les Injections hypodermiques à l'Iodo-tannate d'Hydrarg. soluble," *Bull. gén. de Thérapeutique*, 1888, p. 364, *et seq.*

Its action is said to be very rapid, and the injection is attended with neither pain, nodosities, nor abscesses.

Bichloride of Mercury and Potassium.—This compound was first used hypodermically by Aimé Martin,[1] who used the following formula:

℞. Hydrarg. biniodidi,
Potassii iodidi, āā. gr. vj;
Aquæ destillat., fʒj.—M.

Of this solution as much as half a drachm was injected at a dose. Martin described a severe case of generalized syphilides, which had been treated in vain for two years, which was cured by two of these injections. In the second case syphilis had existed for six months and was rebellious to mercury by the mouth. The usual dermal, mucous, and glandular lesions were promptly caused to disappear by one injection.

Bricheteau[2] considered that the iodide of potassium is irritant to the tissues, and after many experiments adopted a formula containing the double iodide of mercury and sodium, which he thought free from that objectionable quality. His formula was as follows:

℞. Hydrarg. et sodii iodidi, gr. xxiij;
Aquæ dest., fʒiij.—M.

The dose by hypodermic injection is 10 drops, which may be increased to 20. The author advises the use of this formula in cases where rapidity of action is necessary, as in iritis and severe cases of syphilis.

The So-considered Antiseptic Group.

Salicylate of Mercury.—Introduced into pharmacy by Lajoux and Grandval in 1881, salicylate of mercury was first recommended as an antisyphilitic remedy by Silva Araujo[3] in 1887, and since that date it has been used by a number of observers, who claim for it exceptional merit. It is used in pill form, and in suspension it is injected into the muscles.

It is claimed for this new remedy that it is more promptly

[1] "Sur l'Emploi des Injections hypodermiques d'Iodure de Mercure et de Potassium, dans le Traitement de certains accidents de la Syphilis secondaire et tertiaire," *Gazette des Hôpitaux*, Sept. 12, 1868.

[2] "On the Application of the Hypodermic Method to the Treatment of Syphilis by Mercury," *Practitioner*, vol. ii., 1869, p. 141, *et seq.*; and *Bull. gén. de Thérapeutique*, vol. lxvii., 1869, p. 297, *et seq.*

[3] "Du Traitement de la Syphilis par le Salicylate de Mercure," *Bull. gén. de Thérapeut.*, Paris, 1888, cxiv., p. 175, *et seq.*; and "El Salicilato de Mercurio y sus Applicaciones en la Sifilis y en algunas Dermatitis," *Revista de Medicina y Farmacia*, 1887, ii. 2, pp. 12–14.

absorbed than any other mercurial preparation; that it is well borne by the stomach, does not produce gastro-intestinal disturbances or diarrhœa; and that it rarely if ever causes stomatitis. Used by stomach ingestion, salicylate of mercury may be given in pill form in doses of from $\frac{1}{4}$ to $\frac{2}{3}$ of a grain three times daily. If very prompt action is desired, the large dose of 1 grain three times daily may be administered, but Szadek says that if pushed too vigorously the remedy may cause intolerance on the part of the stomach. In doses of 2 grains daily it has been used with benefit for periods of from two to three months, without any cause for interruption. It is claimed to be of especial benefit in the early secondary period, of the lesions and symptoms of which it causes involution and disappearance. In relapsing secondary lesions of the skin and mucous membranes it also proves very effective. In late tertiary forms of syphilis, particularly those affecting the skin, it is also claimed to act promptly and efficiently.

Salicylate of mercury has been used in the form of subcutaneous and intramuscular injection by a number of observers, notably by Szadek.[1] The latter uses the following solution:

℞.	Hydrarg. salicylat.,	gr. xvj–xxiv;
	Mucil. acaciæ,	gr. viij;
	Aquæ destillat.,	f℥vss.—M.

The dose of this liquid is the contents of a Pravaz syringe, which may be administered into the gluteal region beneath the muscular fasciæ every third day. The number of injections used in various cases was from four to twelve. Epstein employed this salt in oil emulsion, and Hahn in suspension with vaseline oil. When used in the form of an injection it is claimed that little harm is produced, that the local reactions are much less severe than by the use of other mercurial salts, and that the resulting nodule gives little inconvenience and is soon absorbed. Jadassohn and Zeissig, Welander Peterson, Tschistiakoff, and others speak in praise of this mercurial salt.

It is interesting to note that Touton[2] reports the case of a man in whom zoster femoralis followed the third injection of salicylate of mercury. Touton is of the opinion that this skin lesion was of reflex origin, and due to trauma of a nerve. This may be considered a very unusual complication of hypodermic medication in syphilis.

Carbolate or Phenate of Mercury was introduced into the therapeutics

[1] "Ueber behandlung der Syphilis mit Intra-musculären Injectionen von Quecksilbersalicylat," *Wien. klin. Wochenschrift*, No. 13, 1890.

[2] "Zoster femoralis im Auschluss an eine intra-musculäre Salicylquecksilber Injection," *Archiv für Derm. und Syph.*, 1889, p. 775, *et seq.*

of syphilis by Gamberini,[1] who regards it both as an effective form of mercury and as being valuable by reason of the supposed antimicrobic action of the carbolic acid. This salt belongs to the group of mercurial compounds which have been prepared and exploited as possessing a distinct antimicrobic effect—a group which is composed of the thymolate, the benzoate, and the salicylate. It is well known that we are wholly lacking in positive knowledge of any micro-organism of syphilis; consequently the claim that an agent possesses a specific parasiticidal effect on the disease is based on pure assumption. This particular preparation is claimed to be as potent as any other mercurial preparation. Carbolate of mercury may be given in pill form, each pill containing one-sixth of a grain of the salt covered with gelatin or balsam tolu. The dose at first is two pills daily, which may be increased to six pills. In some cases six pills produced mild gastro-enteritis, and in one case the remedy was abandoned on account of intestinal colic. In two cases of papular syphilides $\frac{1}{6}$ of a grain of this salt, dissolved in 15 drops of water, was injected during a period of two months without good results. In the hospital at Würzburg this preparation was tried by Happel.[2] He injected about one-third of a grain every day or two, using on an average fifteen injections. He saw no abscesses and very slight nodules. In a few women malaise, headache, and chills were produced.

This new remedy was (as might be supposed) tried by Szadek,[3] who was well pleased with its action in pill form in mild cases and in relapses, administered to adults and young infants. By hypodermic injection into the subcutaneous tissues and the muscles he also used it with gratifying results. He found that it was readily absorbed, and that the injections caused little local and rarely any general disturbance.

Lexer[4] made comparative studies of the effects of injections of various mercurial preparations, and arrived at the following results: That relapses occurred after inunctions in 9 per cent.; after sublimate, in 13; after the salicylate of mercury, in 15; after formamide, in 16; after the peptonate, in 16; after the gray oil, in 16; after the tannate, in 18; and after the carbolate, in 27 per cent. By this showing the carbolate of mercury is among the least efficient of mercurial preparations.

[1] "Il Phenato di Mercurio, nuova medicamento per la cura della Sifilide," *Giornale della Malat. Veneree e delle Pelle*, 1886, p. 241.

[2] "Die Behandlung der Syphilis mit Subcutanen Injectionen von Hydrargyrum Oxydatum Carbolicum," *Inaug. Dissert.*, Würzburg, 1888.

[3] "Innerliche Anwendung des Hydrargyri Carbolici Oxydati bei Syphilis," *Monatshefte für Dermat.*, 1887, p. 195, *et seq.*, and "Ueber hypodermatische Anwendung von Hyd. carbol. oxydat. bei Syphilis," *Ibid.*, 343.

[4] "Beitrag zur Beurthilung der Werthes der Verschiedenen Quecksilber präparate in der Syphilis-therapie," *Archiv für Derm. und Syphilis*, 1889, p. 715, *et seq.*

De Luca[1] also experimented with this salt, of which he administered pills containing about $\frac{1}{3}$ of a grain three to six times a day. The results were no better than those of other mercurial preparations, and were comparable to those of the tannate of mercury. Diarrhœa and intestinal pains were noted in some cases.

It must be remembered that the carbolate, the bicarbolate, or diphenate of mercury, above considered, must not be confounded with diphenyl mercury, which is a deadly poison.

Szadek[2] also used the carbolate of mercury by injections into the subcutaneous tissue and muscles in the form of a 2 per cent. solution in water and gum arabic. He states that no pains were produced, but sometimes the muscles became stiff after the injections. Complications are very rare, and the action of the drug is rapid. Ten injections are usually necessary. Troitzki, who took part with Szadek in these experiments, entertains the latter's views as to the efficacy of the mercurial agent.

A survey of the results thus far experienced in the use of this remedy convinces me that it has no striking qualities, and that it is not to be preferred to the classic preparations.

Thymolate of Mercury (hydrargyrum thymolo-aceticum, Merck) is an insoluble salt which was first used in the treatment of syphilis in Neisser's clinic, the details of which are given by his assistants, Jadassohn[3] and Zeissig. These observers used a 10 per cent. suspension of the drug in fluid paraffine, and injected for a dose from $\frac{1}{3}$ of a grain to 1 grain into the muscular tissues. They think they have seen in its action results not attainable with any other mercurial salt, without the usual drawbacks of pain, infiltration, and abscesses. Thymolate of mercury, used hypodermically, exerts a rapid and energetic action upon syphilitic manifestations, less pronounced than that of calomel, but greater than that of gray oil. Six or eight injections are sufficient for a cure. Wellander[4] of Stockholm, having tried the remedy in forty-four cases, endorses the encomiums of Jadassohn and Zeissig, though he states that it does not attain the ideal of perfection in syphilitic therapy. He used larger doses of the drug than his predecessors, going as high as a grain and a half, and injecting into the subcutaneous tissues as well as into the muscles. In his experience the local inflammatory phenomena were greater than those observed in

[1] *La Riforma Med.*, 1888.

[2] "Du Traitement de la Syphilis par les injections profonds et sous-cutanées de Phenate de Mercure," *Meditzin. Obozrenië*, No. 6, 1887; and *Bull. gén. de Thérapeutique*, 1887.

[3] "Einspritzungen von Salicyl- und Thymol-Quecksilber zur Syphilis Behandlung," *Vierteljahr. für Derm. und Syphilis*, 1888, p. 781, *et seq.*

[4] "Ueber die Behandlung der Syphilis mit Injectionen von Thymol- und Salicyl-Quecksilber," *Ibid.*, 1889, p. 453, *et seq.*

Neisser's clinic. Szadek,[1] who seems to be always on the alert for new antisyphilitic remedies, has published his results with thymolate of mercury. This experimenter uses the following formula:

℞.	Hydrarg. thymolo-acetic.,	gr. xxiiss;
	Mucil. acaciæ,	gr. viiss;
	Aq. destillat.,	fʒv.—M.

Of this liquid the contents of a Pravaz syringe was injected into the thighs every three or four days. The maximum number of injections was eight or ten, and the duration of treatment averaged twenty-seven days. The local reaction was mild, there were no indurations, no nodosities, and never was an abscess produced. These results induced Löwenthal[2] of Senator's clinic to use the drug suspended in glycerin and combined with muriate of cocaine. Improvement was noted after one or more injections; no abscesses occurred in the course of two hundred and ninety-three injections. Salivation was only observed in one patient, having bad teeth, and in another nausea and rigors were produced. Löwenthal thinks that the drug has a future as an antisyphilitic remedy.

Cehak[3] also has used thymolate of mercury on a large scale with excellent results. He injected a 5 and a 10 per cent. emulsion in paraffin oil into the buttocks every second or fourth day. No unpleasant sequelæ were observed.

Benzoate of Mercury.—This preparation was introduced into medicine by Professor Stukobenkoff,[4] is known as hydrargyrum benzoicum oxydatum, and contains 43 per cent. of mercury. It is slightly soluble in cold water, and readily so in alcohol or a weak solution of chloride of sodium. Stukobenkoff has used it extensively in syphilis, employing a solution containing 4 grains of the mercurial, 2 grains of salt, 1 grain of muriate of cocaine, in 1 ounce of water. Of this mixture a Pravaz syringeful is injected daily into the buttock muscles. It may also be used as a 10 per cent. solution in liquid vaseline. This drug is said to act very rapidly upon early and late secondary lesions. A sensation of slight burning, which lasted two or three days, was observed, as well as mild gingivitis and salivation. It may also be administered in pill form (gr. $\frac{1}{5}$ to $\frac{3}{4}$), but the recorded results of its

[1] "Zur Behandlung der Syphilis mit intra-musculären Injectionen von Hydrargyrum Thymolo-aceticum," *Wiener med. Wochenschrift*, 1890, No. 22.

[2] "Intramusculäre Einspritzungen von Hydrargyrum Thymolo-aceticum bei Syphilis," *Deutsche med. Wochenschrift*, 1890, xvi. p. 544.

[3] "Ueber Thymolquecksilber-injectionen," *Allg. Wien. med. Zeitung*, 1890, No. 7.

[4] "Ein Neues Hg-Salz-Hydrarg. benzoicum oxydatum zur Behandlung der Syphilis," *Vratch*, No. 4, 1889, p. 93; and *Vierteljahr. für Derm. und Syphilis*, 1889, vol. xxi. p. 439.

action are not striking. Its sponsor also used it in its purity, and in liquid form as an application for chancroids, and for gonorrhœa and gonorrhœal cystitis as an injection.

Stukobenkoff's preparation has been used at the Lourcine Hospital in Paris by Balzer and Thiroloix, and their results are given in the thesis of Cochery.[1] The formula already given was used by the French observers, who found that it was a very unstable compound, in that in fifteen days two-fifths of the mercury was lost by decomposition and precipitation. The objection which applies to all soluble salts of mercury, that the dose needs daily repetition, is urged against this salt. Its sole advantage, according to these experimenters, is the mildness of the pain following the injections. Their conclusion is terse and to the point: "*En resumé, une nouvelle formule d'injection à ajouter aux autres mais un progrès bien minime s'il existe méme.*"

The Amide Group.

Formamide of Mercury.—Formamide of mercury, hydrargyrum formamidatum, was introduced as an antisyphilitic remedy by Liebreich.[2] This observer, impressed with the view that the amides of the body—of which urea may be taken as the principal one—pass out of the system in an undecomposed state, concluded that if combined with mercury decomposition would occur, and that the latter would be reduced and deposited in the tissues; in other words, that this amide would serve as a vehicle for the diffusion of the mercurial. Liebreich is said to have demonstrated this fact before the Medical Society of Berlin. He employed a 1 per cent. solution, and administered one or more Pravaz syringefuls daily into the subcutaneous tissues. The formamide is readily soluble in water, of neutral reaction, and does not coagulate albumin. The action of the drug is rapid and effective. Injected under the skin, it is easily borne, attended with little pain, and not liable to produce salivation. It is said by Liebreich to be much less irritating and painful than the sublimate. Relapses after this treatment are said to be rare, and mild in character. Kopp[3] in Neisser's clinic treated one hundred and twenty-six cases by Liebreich's method, which he submitted to what seems to have been a careful and impartial trial. He used from twenty-five to forty injections into the buttocks in early and late syphilis. He observed salivation and stomatitis in twelve cases (four men, eight women), abscess-forma-

[1] *Traitement de la Syphilis par les Injections sous-cutanées de Benzoate de Mercure*, Paris, 1890.

[2] "Ueber die Behandlung der Syphilis mit Quecksilberformamid," *Wien. med. Presse*, 1883, xxiv. pp. 17–20.

[3] "Ueber die Behandlung der Syphilis mit Subcutanen Injectionen von Hydrargyrum formamidatum (Liebreich)," *Vierteljahr. für Derm. und Syphilis*, 1885, Heft. 1 and 2, p. 55, *et seq.*, and 184, *et seq.*

tion in one woman, pain of a mild and ephemeral character in thirty-four cases, and in a more lasting and pronounced form in thirty-one cases. Subcutaneous nodules and inflammatory infiltration occurred forty-one times. Kopp concludes from the treatment of mild cases that relapses are frequent, and that it is less energetic than inunctions. The formamide solution keeps better that that of mercurial peptones, but not as well as a solution of the cyanide of mercury. Zeissl[1] the Younger used the formamide in fifteen cases. He found the pain less than that of sublimate, and that no inflammatiory reaction was induced. On the arm or forearm he saw in one case a little redness and swelling, which disappeared in two or three days. The lesions in the immediate vicinity of the injected spots did not disappear more rapidly than those more remotely situated. In several cases limited portions of the skin became gangrenous. Stomatitis was also observed. In rebellious cases Zeissl used a greater number of injections, of which twenty was the average for a cure. Rona[2] used the formamide upon fourteen cases, of which only five kept up the treatment to the end, three refusing treatment after the first injection, five after the third, and one after the ninth, on account of the severity of the pain. The therapeutical effect of the drug was highly unsatisfactory, and in one of the five cases mentioned as having kept up the treatment a relapse occurred very promptly. The most recent observer who has experimented with Liebreich's compound is Vyshogrod,[3] who treated with it two hundred and twelve patients, Russian soldiers. This author speaks of the rapid disappearance of secondary syphilitic lesions, of the rarity of abscess indurations and of relapses, and of the absence of mouth affections. Added to its activity, its painlessness, and freedom from disagreeable complications, the author thinks the remedy has the further advantage of being cleanly and cheap. In remarks upon Vyshogrod's paper Lünkevitch of Tiflis spoke of the formamide as one of his favorite remedies, and Korona of the same place endorsed it as effective and comparatively painless, and without abscesses when given in the buttocks, but followed by abscesses if given in the back. On the other hand, Gay of Kazan says that the formamide is the most painful of all mercurials, while the bicyanide is the least painful. The latter thinks that all mercurials cause the least pain when they are injected into the buttocks, and the most intense when introduced into the scapular and lumbar regions.

[1] "Zur Behandlung der Syphilis mit Quecksilberformamid," *Wien. med. Presse*, Nos. 5 and 6, vol. xxiv., 1883.

[2] Syphilis gyógyi-ása formiamidum hydrargyratum (higany-formiamid) oldàtaval, *Orvosi hetil*, Budapest, 1883, xxvii. pp. 294–298.

[3] *Proceedings of the Caucasian Medical Society*, May 14, 1889, p. 39; and *British Journal of Dermatology*, vol. i. pp. 381, *et seq.*

Some years ago I used this compound hypodermically in several selected cases, and by reason of its comparative slowness of action and of the severe pains induced I soon abandoned it.

Glycocoll of Mercury.—Wolff[1] of Strasburg claims that combinations of (1) glycocoll, (2) of alanin, and (3) of asparagin with mercury are much to be preferred to the formamide of Liebreich, as being more prompt in their action. Given in large doses, these salts produced active salivation and severe effects upon the gastro-intestinal canal. They cause only slight local reaction, and after the injection of 0.01, mercury is found in from six to twenty-four hours in the urine. Wolff thinks that if the reaction at the point of injection is slight, the mercurial preparation acts more quickly, for the reason, he claims, that albuminate of mercury is not formed and absorption of such a deposit is not necessary; in other words, that the remedy is taken up without having undergone chemical metamorphosis.

The durability of the three preparations of Wolff varies. Asparagin-mercury is very unstable; alanin-mercury keeps better; and glycocoll-mercury is a stable product. It is prepared as follows:

℞. Hydrarg. oxid.,	gr. iss;
Glycocoll.,	gr. iv.

Dissolve the glycocoll in 77 minims of water, then add the mercury. When mixed, add water enough to make $2\frac{1}{2}$ drachms, and filter. This is the solution for general use. Or it may be made as follows by keeping on hand these solutions:[2]

1. A solution of carbonate of sodium 1.50 to water 100.
2. Sublimate 3.75 in water 100.
3. Glycocoll 2.50 in water 100.

These must be kept in stoppered bottles. A mixture of equal parts of each of these solutions forms the injection fluid. The dose is a Pravaz syringeful, which contains 1 centigramme of oxide of mercury. The needle of the syringe must be of platinum. The injections, according to Wolff, are best made in the back, after the method of Lewin (see Sublimate Injections). One injection should be made every day or every second day. Secondary manifestations are promptly effaced by this treatment, but it is evident, from Wolff's remarks, that a sharp lookout must be kept, lest untoward symptoms supervene. Wolff thinks that the prompt elimination of mercury in this form is very advantageous.

[1] "Ueber die Subcutane Anwendung des Glycocoll-Asparagin und Alanin-Queck-silbers und deren Wirkung auf den Syphilitische Process," *Monatshefte für Praktische Dermatologie*, vol. iii., 1884, p. 152.

[2] *Annales de Derm. et de Syphilograph.*, vol. v., 1884, p. 645.

Alaninate of Mercury.—This preparation, hydrargyrum alaninicum, was first brought forward as an antisyphilitic agent by De Luca,[1] who claims that it is exceptionally well tolerated by stomach ingestion and by hypodermic injection. In the latter form, it is, he claims, preferable to all other mercurial preparations, by reason of the smallness of the dose required and the mildness of the local reactions. In infantile syphilis it is to be preferred to other forms of mercury when given by the mouth. In whatever manner given, its effects are gratifying and particularly lasting. It may prove of benefit in cases of late syphilitic manifestations. Selenew,[2] to test De. Luca's statement, employed this treatment in twenty-three cases, using a 1 per cent. watery solution, and injecting $\frac{1}{5}$ of a grain of the salt into the buttocks once daily. The number of injections required varied between twenty-four and fifty-four, and the average sojourn in the hospital was fifty days. Selenew concludes as follows: Alaninate of mercury does not offer any advantages over other soluble preparations of mercury now in use, either as regards the intensity of its general action or its local effects or complications. 2. In the course of its therapeutic use fresh eruptions appear frequently; which fact, therefore, indicates a feeble antisyphilitic power of the drug. 3. In about 40 per cent. of cases the injections give rise to local pain of mild character and to circumscribed infiltration. 4. In about 50 per cent. of cases the remedy induces gingivitis and stomatitis, and in some few a mild and ephemeral diarrhœa. 5. Elimination of mercury in the urine begins on the first day of treatment, and increases between the twentieth and thirtieth injections, and undergoes oscillations during subsequent days; and in this presents nothing unusual. 6. The preparation is very stable, and in a dark bottle will remain unchanged for many days; and in this respect it is superior to the bicyanide and formamidate of mercury.

Succinimide of Mercury was discovered by Dessaignes in 1852, and was introduced as an antisyphilitic remedy by Vollert[3] in 1888, under the auspices of Professer Wolff of Strasburg. It is soluble in water, does not become cloudy, and does not precipitate albumin or hydrocele or pleuritic effusions. It causes little infiltration, and never abscesses, if carefully used. Wolff introduces the syringe obliquely, and endeavors in this way to distribute the liquid in the cellular tissue. He further aids diffusion by gentle massage. The dose is about one-tenth of a grain and upward, dissolved in water and injected into the buttocks. The usual advantages are claimed for this agent.

[1] "L'Alinina Mercurica (alaninato di Mercurio) nella terapia della sifilide," *Riforma Medica*, March, 1888.

[2] "Das Quecksilberalanilat bei Syphilis," *Meditzin Obozren.*, No. xvii., p. 445, *et seq.*

[3] "Ueber Succinimid-Quecksilber ein neues mittel zur Subcutanen Injectionen," *Therapeut. Monatshefte*, Sept., 1888, p 401, *et seq.*

Selenew[1] has also used the succinimide in the form of a 1 per cent. solution upon thirty-three patients, requiring nine hundred and thirty-three injections. His conclusions are as follows: Syphilitic manifestations disappeared after twenty-four to forty injections. After or during the first five injections roseola and papules often increased in extent and intensity. The initial sclerosis and the ganglia were but little affected. Gingivitis was observed in six cases. Pain and infiltration were almost always absent. Relapses observed during seven months occurred in $8\frac{1}{2}$ per cent., against yellow oxide 8, alanilate 20, salicylate 37, and gray oil 30 per cent. Mercury is found in the urine within the first few days. It is therefore a mild preparation, suitable for mild cases in women and children. In general its action is not very energetic.

Urea-Mercury.—Schütz,[2] in Doutrelepont's clinic, has used a combination of urea with mercury in the treatment of syphilis. He thinks that mercurial preparations formed with the amides are the most efficient, and that urea, the amide of carbonic acid, is preferable to Liebreich's formamide and Wolff's amide. Schütz used the following prescription:

℞.	Hydrarg. chlor. corros.,	gr. xv;
	Aquæ destillat.,	f℥iij;
	Urea,	gr. iiiss–viiss.—M.

Of this solution the dose is a Pravaz syringeful once daily.

This preparation is readily absorbed, and is very promptly found in the urine. It is said to cause little local reaction of any kind, and to produce the rapid disappearance of syphilitic lesions. It has the advantage also of being cheap, hence it can be used in charitable practice. The length of treatment was from thirty-three to eighty-seven days, or an average of seven and a half weeks.

Iodoform.—This agent was first used subcutaneously in syphilis by Bozzi[3] in a case of severe nocturnal osteocopic pains, together with periodic chills and fever, for all of which quinine in large doses had been given without benefit. Two injections of iodoform, each containing $1\frac{3}{4}$ grains suspended in glycerin, were given at an interval of nine days. There was marked benefit after the first injection, and two days after the second there was entire subsidence of the pains. Abscesses followed each injection. This treatment was then forgotten for many years.

[1] "Zur Syphilis-Behandlung mit Subcutanem Injektionen von Hydrargyrum Succinimidicum," *St. Petersburgh med. Wochenschrift*, No. 36, 1890; and *Monatshefte für Prak. Dermat.*, vol. ii., 1890, p. 406.

[2] "Ueber Quecksilberchloridharnstoff: ein neues Antisyphiliticum," *Deutsche med. Wochenschrift*, 1885, p. 215, *et seq.*

[3] "Dolori Osteocopici Sifilitici curati colla Injeztione Sottocutanea di Iodoformio," *Giornale Italiano della Malattie Vener. e della Pelle*, vol. i., 1871, pp. 49 and 50.

In 1882, Thomann[1] published a short paper, in which he detailed good results from the injection of iodoform in early syphilis and in cases of the initial sclerosis and of ganglionic enlargement. He began with doses of 0.30 (grs. $4\frac{1}{2}$), and increased them to 0.75 (grs. $10\frac{3}{4}$). The drug was suspended in glycerin and almond oil, the latter combination seeming to cause more cutaneous hyperæmia than the glycerin mixture. The effects were said to be good, the pain on injection slight, and the after-effects very mild.

Neumann[2] also tried this agent hypodermically, and found that while it caused the disappearance of early syphilitic manifestations, its action was very slow, and that inflammatory reaction was produced.

Mraček[3] reported a case of early syphilis in which in thirteen days 6 grammes of iodoform suspended in glycerin were injected. The therapeutic result was not striking. Iodine was promptly found in the urine, and only disappeared therefrom after the lapse of forty days.

In a later communication Thomann[4] concludes that this agent is useful in the second stage in producing resolution of swollen ganglia, particularly when the injections are made in close proximity to them. It is, however, most beneficial in tertiary syphilis, when 0.50 to 1.50 are used at a dose. Thomann says that in his later observations he used as much iodoform in thirteen injections as he had at an earlier date in sixty-five injections, and that he produced no bad results. He concludes—

1. That in tertiary syphilis iodoform exerts a favorable influence upon the healing process.

2. That large doses shorten the length of treatment.

3. That a long time after the discontinuance of the iodoform injections (as long as forty-three days) iodine is found in the urine. It also appears that the remedy has a lasting effect upon the system.

4. That no bad effects are to be observed, such as acne, iodine-catarrh, etc.

It must always be remembered that iodoform, whether applied to wounds of any kind or administered by the stomach or hypodermically, is a very uncertain remedy, and liable, even in moderately small doses, to produce toxic effects of varying gravity. Consequently, if the physician sees fit to give it a trial he should watch its effects very carefully, particularly as to the cerebro-spinal system. In this connection it is

[1] "Ueber Subcutane Iodoform Einspritzungen bei Syphilis," *Centralblatt für die Med. Wissensch.*, No. 44, 1881; and *Ibid.*, No. 35, 1882.

[2] "Ueber Hypodermatische Behandlung der Syphilis mit Iodoform," *Anzeiger der Gessel. d. Aertze*, No. 27, Vienna, 1882.

[3] *Ibid.* "Ueber Hypodermatische Behandlung der Syphilis mit Iodoform."

[4] "Ueber Behandlung der Tertiären Syphilis Mittels Iodoform Einspritzung," *Centralblatt für die Med. Wissenschaften*, No. 20, 1882.

interesting to note that Jennings[1] observed purpura in a man who had been taking the drug by the stomach in one-grain doses three times a day for six weeks. Upon its discontinuance the eruption ceased. The mental symptoms produced by the drug are stupor and obtuseness, delirium, and even mania.

Iodide of Potassium.—This agent was first used hypodermically by Eulenberg and Thierfelder, but as a method of treatment it has not been largely adopted. In 1882, Besnier[2] reported a case of intolerance of this drug, in which 7½ grains, taken by the mouth, produced extreme pruriginous disturbance, and in which he injected the same dose into the centre of a gummatous syphilide without producing the same phenomena. He then remarks that this new therapeutical procedure should be made the subject of experiment, in order to determine its practical worth. In a later[3] communication Besnier states that he has further used this treatment, and still thinks well of it.

Gilles de la Tourette[4] in five cases injected 7½ grains of the iodide without any marked local complications. He advises that the solution shall be neutral, that the injections should be made deeply into parts rich in cellular tissue, and that the punctures should be made quite far apart. Slight massage over the site of injections is beneficial in relieving the disagreeable itching produced by the injections. Hypodermically used, the author thinks that cases of iodide idiosyncrasy and intolerance may be overcome. The drug acts very rapidly when used in this manner.

Jackubowitz[5] recommends parenchymatous injections for syphilitic adenitis and inflammed ganglia due to any cause. He uses a solution of iodide of potassium 15 grains, tincture of iodine 5 drops, in 1 ounce of water. By means of a hypodermic needle this is thrown into the substance of the glands. The needle is thrust obliquely into the most prominent part of the swelling, and a fourth part of the contents of the syringe is slowly thrown in. In four such manœuvres the syringe is emptied. Several such operations are often necessary for a cure. The pain is stated to be mild, though slight uneasiness is felt, owing to the distension of the tissues. In those cases, not uncommon, in which the glands are very much swollen, as well as in some cases of subacute adenitis of simple origin, this method may be employed.

[1] *Journal of Cutaneous and Genito-urinary Diseases*, 1888, p. 175.

[2] "Un cas d'Eruption bulleuse due à l'Iodure de Potassium," *Annales de Derm. et de Syphilographie*, 1882, p. 169.

[3] "Sur les Injections sous-cutanées d'Iodure de Potassium," *Progrès médical.*, Jan. 13, 1883.

[4] "Note sur les Injections sous-cutanées d'Iodure de Potassium, Société de Biologie, Jan. 3, 1883," *Annales de Derm. et de Syph.*, 1883, p. 610.

[5] "Zur methode bei Parenchymatösen Injectionen, eine neue Behandlung der Syphitilischen Bubonen," *Wiener med. Presse*, Nos. 3 and 4, 1875.

In this connection it may be well to mention some late observations by Köbner,[1] though the injections were made into the rectum rather than into the cellular tissue. Köbner presented to the Dermatological Society of Berlin, two years after cure, the case of a woman fifty-six years old who had had syphilitic myositis of the whole left sterno-cleido-mastoid muscle, of eleven years' standing. She had also the same lesion of the lower third of the right sterno-cleido-mastoid, as well as gummy infiltrations into other muscles and into various bones. The iodide, given by the stomach, acted badly, and the woman refused to take it. Inunctions of mercurial ointment and injections of about 12 grains of the iodide into the rectum produced a complete cure in about nine weeks. Köbner thus uses the iodide in all cases of old syphilis in which it produces gastric or general disturbances when given by the stomach. In cases of cerebral syphilis in which there is difficulty of deglutition, and in syphilitic coma, large quantities of the drug may be thus introduced into the system. Professor Rabow in the treatment of mental diseases found Köbner's method of using the iodide and bromide of potassium more satisfactory and rapid than any other. Köbner also claims that he has caused more or less absorption of hypertrophied prostates by means of the rectal injection of the iodide and bromide of potassium combined with belladonna. In order to determine the fact of the absorption of the iodide, Köbner advises that the distal half of the tongue, on its upper or lower surface, or the inside of the cheeks, shall be lightly painted with a solution of nitrate of silver. The solution at once turns yellow if the saliva contains iodine from the formation of iodide of silver.

Thermal Baths; Hot-water and Hot-air Baths; Sublimate Lotions and Baths, and Electro-mercurial Baths.

The Hot Springs of Arkansas and the Treatment of Syphilis.—From time out of mind the waters of mineral springs have been regarded by the laity as curative, and even specific, in the treatment of syphilis and skin diseases especially, and in certain visceral and arthritic diseases. There has been, and perhaps always will be, a deep-rooted belief that waters made in the laboratory of Nature possess an occult and potent effect far in advance of any production of the chemistry of man. Among the many and varied mineral and thermal springs of this country, those of the Hot Springs of Arkansas have undoubtedly taken the most prominent rank, and among the laity, and even among the profession, there is a widespread belief in their efficacy in syphilitic affections, skin diseases, and those of a rheumatic nature. For many years I have had exceptional opportunities for studying the effects of the waters of the Hot Springs, and the treatment pursued there upon

[1] "Ueber die Anwendung von Iod- und Brom-präparaten per Rectum zu localen (regionären) und Allgemeinen Heilzwecken," *Therapeutische Monatshefte*. 1889, No. 10.

patients who have been under my care and were temporarily sent there for benefit, upon patients who had been under other physicians prior to their sojourn at the Hot Springs, and upon others whose treatment had been begun there. From this large number of cases I hope to be able to present a fair estimate of the value of these springs as a therapeutic resource in the treatment of syphilis.

An analysis of the water of the most prominent springs in the Arkansas Valley shows that their chief ingredient is silicic acid, and that it, with iron, alumina, lime, magnesia, potash, soda, and traces of iodides and bromides, exists in the proportion of $8\frac{1}{2}$ grains to the gallon of water. It is very evident that no startling effect can be produced by this natural solution, yet some of the advocates of the springs speak in quite positive terms of the specificity of the waters, whatever that may mean. Others claim that the beneficial effect of the waters is due to the electricity, produced by chemical decomposition, with which they are said to be charged, while others think that they are imbued with a peculiar heat which is curative. To my mind, the salutary and hygienic effects of these waters (as far as they are productive of good) reside in their heat alone. The stimulation of the capillaries and of the circulation generally, including the lymphatic system, as well as the stimulation of each individual cell of the skin, by the heated water, and the brisk frictions subsequent to the bath, I think act as profound vitalizing agents and are productive of great benefit. But there are many accessory conditions appertaining to a sojourn at these thermal springs which play a very important part in the hygienic reconstruction which is often gained. Having taken the long journey, after much anticipation, preparation, and often at great sacrifice in the matter of time and money, patients arrive at the springs with an earnestness of purpose and with a fixed resolve that they will make any personal sacrifice, particularly in the matter of creature comforts, in order to be benefited or cured. They for a time undergo personal reformation, and usually sedulously refrain from alcoholics, from tobacco, from the card-table with its late hours, and from sexual indulgence. They, as far as they can, leave behind them all business and social cares; they eat regularly, go to bed early, and perhaps sleep late, and, in short, conform as far as possible to the most rigid hygienic rules. They have an entire change of scenery and of domestic relations, and, in fact, of the whole routine of life. They breathe a pure air, have abundant opportunity for outdoor exercise, and generally enjoy rest and contentment. Certainly, no one can ask for more auspicious auxiliaries to medical treatment.

It has been claimed that the sedation and tendency to sleep induced by the baths at the Hot Springs are peculiar and due to some occult effect of the waters. It is true that, as a rule, hot baths usually have

an opposite effect, but I have many times seen the same soporific result follow hot salt-water baths taken at our seaside resorts. In some instances I have found that excitement and sleeplessness followed baths taken at the Hot Springs.

Let us now consider the conditions in which benefit may accrue to syphilitics who undergo treatment at the Springs. While I am disposed to give this celebrated resort its full meed of praise in the treatment of syphilis, I must here state my emphatic belief that in the majority of cases there is not the slightest necessity of going so far away to attain a cure, and that a very large number of the cases which go there do so because they have not been properly handled at their homes. In other words, the faultiness in the physician's methods of treatment and his shortcomings in the management of his patients are, in many instances, the real reasons why patients have to betake themselves so far away for relief. Furthermore, in very many instances the apathy of the patient, his carelessness and irregularity in following treatment, his absorption in business matters, his often flagrant want of attention to health and hygiene, so impair his physician's efforts that he perhaps obtains no good, and possibly grows steadily worse.

At no time during the primary stage of syphilis does treatment at the Hot Springs offer any advantage whatever. Treated on the classical lines, the chancre can always be healed, and in the rare event of phagedæna we are certainly as well equipped at home as our colleagues at the Springs. In like manner, no peculiar benefit can be derived in the early exanthematic stage. At this time the general health and nutrition of patients is usually good, and they, as a rule, respond readily to the action of mercurials.

All fair-minded men, however, who have much to do with the treatment of syphilis must certainly admit that in certain cases and in certain conditions a sojourn, under proper medical care, at the Arkansas Hot Springs is very often followed by the most gratifying results.

I myself have sent many cases to colleagues at the Springs, and have never had occasion to regret it; and I am glad that as a therapeutic resource we have these springs at our command in cases of urgency and need. While in general we can readily manage the cases of ulcerating syphilides, including the impetigo form, the ecthyma form, the rupial, and the serpiginous, we certainly do find instances which are rebellious and which improve wonderfully at the Springs. In these cases, however, we have usually, as complicating conditions, anæmia, debility, and malassimilation, in which event specific medication is more or less slow or impotent in its working. Many of these cases have run the gamut of mercurial and iodide-of-potassium treatment, and these remedies then act as depressants, rather than as anti-

syphilitics. In such cases the change of scene and air and the baths are of inestimable value.

The matter may be summed up in this way: In many cases where cachexia, due to any cause, and intolerance of the usual specific medication, are found to exist and the activity of the syphilis still persists, treatment at thermal springs is indicated.

In many instances of gummata in broken-down subjects the baths are often of great value, and I have seen gummatous infiltration in the throat much benefited by the treatment used at the Hot Springs.

The osseous and articular lesions of syphilis may be only temporarily benefited at the Springs, but late syphilitic rheumatism, rheumatic conditions complicated with visceral disease, combinations of gout and syphilis, late syphilitic cachexia without visible lesions, and the generally broken-down state of old syphilitics addicted to alcoholic and other indulgences, are all frequently much benefited, and some cases thereafter enjoy fairly good health.

When, owing to the usual causes already spoken of, syphilis does not go on auspiciously to its extinction, a sojourn at the Hot Springs is often of decided value for its moral as well as its physical effects. Such patients when at home live in a rut, and, while they perhaps keep at their daily affairs, they are depressed and perhaps more or less despondent. Change of scene, of air, of habits and customs enlivens them, while previously the treadmill of their existence had made life burdensome.

In persistent and chronic cerebral and spinal affections of the most varied character due to syphilis, and the various morbid states and dyscrasiæ which so commonly complicate it, protracted sojourns at the Hot Springs are often productive of marvellous results. In these cases very often the tolerance of antisyphilitic agents, which are so necessary to relief and cure, is obtained, and patients are often rescued from invalidism and death.

But there are still other considerations offered by the treatment pursued at the Hot Springs. Many cures are there made for the reason that mercury is not withheld from the sufferer, as it had been at home. Many of the Hot Springs physicians are alive to the fact that the methods of treatment pursued by many surgeons in the large cities are faulty. These latter often fail to cure their cases for the reason that they use mercury in too small quantities. They do harm with the drug rather than good. They do not eradicate the disease, but by their timorousness and want of vigorous treatment induce a condition of hydrargyrosis—a mercurial cachexia. I have seen many instances of this complication. At the Springs, after proper preparatory treatment, they receive mercury liberally, and it acts well upon them physically and morally.

This fact, to my knowledge, will account for many seemingly surprising cures made at the Hot Springs.

Then, again, there are teachers who inculcate the doctrine that mercury is only beneficial in the early part of syphilis—let us say in its first year. After that it is by them taught that its function is ended and the era of iodide of potassium begins. This fallacious doctrine often works sad havoc on patients, and they hie them to the Springs to regain their health and to get their sovereign panacea, mercury. If this remedy had been administered at the patients' homes, they would not have had the necessity of knocking at the Hot Springs surgeon's door and of begging for relief.

In like manner, in many instances the administration at the Springs of iodide of potassium in large and increasing doses has cured cases which languished in suffering and disease at home because only small doses were given. But I think the tendency to minimize the dose of the iodide of potassium is not as widespread among the profession as it is in the case of the mercurial preparations.

In the foregoing paragraphs I think I have shown that the successful treatment of syphilis at the Hot Springs is in many instances due to the derelictions and shortcomings of the home physicians, who were imbued with faulty ideas as to the dose of mercury necessary for cure, and often to the method of use.

I think that in a large number of cases (and I have seen scores of instances) patients have resorted to the Hot Springs for treatment of syphilis because their cases were not actively handled, were not thoroughly medicated, or were treated in a free-and-easy, happy-go-lucky manner, or were treated in a too stereotyped, narrow-gauge way at their homes. But here it is well to remember that many cases of syphilis do badly or go wrong in consequence of the apathy and want of care and of the indulgences on the part of the patient.

Furthermore, there is another very important consideration regarding syphilitics at the date of the onset of their malady. Though they may have been deeply impressed with the gravity of their condition, they often become lulled into a feeling of false security after a sojourn at the Springs. I have seen many patients who in later years have suffered severely from syphilis, and who on the breaking out of their disease had hastened to the Hot Springs. They there underwent a course of treatment, and the evidence of their disease vanished. Thinking that besides the skill of man they had, as we may say, supernatural aid from the wells of Nature, many have gone away with a sense of happy security, imagining themselves cured; others have thought that a similar sojourn a few months or a year later was all that was necessary; while others, again, have decided to apply for medical aid only if they should notice later manifestations of their disease. This glamour of

security and health conferred by the mystery of the waters has brought many a man to invalidism and death through some late-appearing cerebral or visceral lesion of syphilis.

There is, however, no necessity for taking such a long journey, for other springs will do equally as well. In Virginia, and elsewhere in America, there are hot springs which will act as valuable adjuvants in the treatment of syphilis, and this is the sole action of the Arkansas springs. Take away the mercurial ointment and iodide of potassium from any thermal spring, and its business will soon close up for want of patronage.

During the summer months syphilitic patients can enjoy pure air, beautiful scenery, and repose and quiet at Richfield Springs, where also they may have any form of bath, and may under medical advice partake of natural sulphur waters. There is nothing to be obtained at the Arkansas Hot Springs which cannot be had at Richfield.

The internal use of the waters of the Hot Springs of Arkansas has been claimed to be very beneficial in the treatment of syphilis, and the idea is fostered in that happy valley that these waters are in a measure specific. Such, however, is not the case. They simply act as diaphoretics aud diuretics, and can at any health resort be replaced by a draught of hot milk, hot tea, a little gin and hot water, a little essence of ginger and water, or any other pleasing and innocuous hot drink.

In the section on Mercurial Inunctions the question of the value of sulphur water has been considered. I may here repeat that the experience of physicians at Aix-la-Chapelle and at other springs which give forth sulphur waters goes to show that in certain cases, particularly chronic ones, these waters, in combination with proper mercurial treatment, act very beneficially as diaphoretics and eliminants. My reading and experience teach me that there are no criteria in any case by which it may be stated that sulphur waters are indicated, or that they will probably produce benefit. The only course to pursue is to try them, and be guided by the results observed. It has been claimed that these waters tend to advance the elimination of mercury from the system of those who have been long and injudiciously dosed with that drug. In support of the statement, chemical analyses of the urine in such cases have been made and published to show that mercury has thus been ferreted out and thrown off, but in many of them it is very probable that the synchronous employment of hot sulphur-water baths has had much to do with the eliminative process.

Still further, it is claimed that the internal use of sulphur waters has a direct action in preparing the system to receive mercury and throw off the syphilitic poison. This assertion may be partly true, but we should always remember that change of air and scene, rest, and improvement of the patient's habits and regimen also have much influ-

ence in preparing him to receive treatment and in making his tissues less vulnerable to the syphilitic poison.

Liebreich has stated than when mercury acts slowly or ceases to act the original susceptibility of the system to it may be restored by a generous diet and an abundance of salt. I have many times witnessed marked improvement in old cases of syphilis, which had hitched and halted in a mercurial course, from daily hot sea-baths. In these cases, however, a change of air and scene were also essential factors of benefit.

The subject of the influence of hot baths in the treatment of syphilis has of late years attracted much attention, and one of the most valuable papers upon it is by Dr. Vasily K. Borovsky,[1] who investigated the subject at the suggestion of Professor Tarnowski. This observer carried out his clinical observations on 28 syphilitic patients. Heat was employed in the form of (*a*) ordinary hot-water baths at 98° to 104° Fahr. of thirty minutes' duration; (*b*) artificial sulphur-baths (prepared by adding 1 pound of sulphur to each bath at from 100° to 104° Fahr. of from twenty to thirty minutes' duration; and (*c*) hot-air baths at from 180° to 200° Fahr. of from fifteen to thirty minutes' duration. Dr. Borovsky's results may be summarized as follows: 1. Both tepid and hot-water baths, as well as those of sulphur and hot-air, invariably increase the elimination of mercury in the urine. 2. The elimination proceeds more energetically the higher is the temperature to which the patient is exposed. 3. The cause of such intensified excretion of mercury should be sought in an increase of the systemic metabolism, accompanied by the disintegration of mercurial albuminates. 4. A mercurialized patient's organism actually can be completely freed from mercury by means of a systematic employment of heat in one form or another. 5. In such cases, when the elimination of mercury ceases spontaneously, it can be made to reappear by the use of hot baths. 6. Mercurial stomatitis can be cured by heat more quickly than by any other means. 7. Hot-air baths, while inducing an enormous perspiration, promote the elimination of mercury also through the sweat-glands. The total quantity of sweat excreted during a bath amounts to 400 c. cm. and more; that of mercury in the sweat to 1.6 milligrams and more per 400 c. cm. Hence, as a means for freeing the patient's system from mercury they should be preferred to all other baths. 8. The appearance of mercury in the sweat naturally suggests that diaphoretics generally are useful adjuvants in the treatment of mercurialism. 9. Tepid baths (88°

[1] "On the Influence of Hot Baths on the Elimination of Mercury in the Urine," *St. Petersburg Inaugural Dissertation*, 1889; and *British Journal of Dermatol.*, 1889, vol. ii. p. 22. (I am much indebted to Dr. Valerius Idelson for his admirable abstracts of recent papers in Russian medical journals which have appeared in the above-mentioned journal.)

Fahr.) should only be resorted to in cases of hydrargyrosis in which higher temperatures are contraindicated on some grounds. 10. Hot-air baths are borne by patients better than hot-water ones (98° Fahr.), which sometimes give rise to fainting. 11. Hot-air baths at 170° or 180° Fahr. of twenty minutes' duration were borne better than those at from 140° to 160° Fahr. of thirty minutes' duration, while the physiological and therapeutical effects of the former are practically identical with those of the latter. 12. In persons having an idiosyncrasy against mercury the employment of heat sometimes affords the possibility of safely continuing mercurial treatment. 13. Hot-air baths, while inducing intense thirst, involve an increased ingestion of fluids, which in its turn leads to an increase in the bodily metabolism. 14. As regards the elimination of mercury from the organism, artificial sulphur-baths do not offer any advantages whatever over other baths. 15. The time required for the complete excretion of the metal from the patient's system varies according to the total amount ingested, individual peculiarities of the patient, temperature of the baths, etc. 16. A simultaneous treatment of syphilis by mercury and heat may sometimes effect a cure more quickly than a mercurial treatment alone. 17. The heat-treatment alone (one or two baths daily for a fortnight), however, usually proves powerless to bring about a cure. 18. In patients with diseased vascular system the use of hot water requires great caution.

The practical deductions to be made from this study are that as an adjuvant to a mercurial or a mixed treatment heat, dry or moist, may be employed in certain conditions and with certain restrictions, with much benefit. Thus it is well to order patients taking mercury to take one or two hot baths each week on going to bed. They undoubtedly increase the potentiality of the drug and benefit the patient by increased elimination and metabolism. They may also take Turkish or Russian baths. Baths of moist heat with mercurial fumes have already been treated of in this article.

The subject of the local treatment of syphilis by heat has recently been prosecuted by Dr. Kalashnikoff[1] of St. Petersburg upon thirty-two hospital patients. In cases of generalized syphilides one of the patient's upper or lower extremities (the most affected one) was placed in a hot bath, 117° or 118° Fahr., for half an hour twice a day (morning and evening). During the intervals the limb was constantly kept wrapped in a warming compress. In cases of syphilides situated on the hands, buttocks, neck, face, genitals, and such regions of the body generally, where local baths were impracticable, either hot fomentations or an india-rubber bag containing hot water, 115° or 120° Fahr., were applied

[1] "On the Local Treatment of Syphilis by Heat," *St. Petersburg Inaugural Dissertation*, 1889.

to the part for an hour twice daily, and in the intervals constant warming compresses were adjusted. Kalashnikoff found that local heat affords a powerful means for promoting the absorption of syphilitic products in the region treated. Primary, secondary, and tertiary lesions subjected to the influence of heat, 117° or 118° Fahr., were made to disappear more quickly than by mercurial treatment. Under a simultaneous treatment by heat and mercury the resolution of syphilides was even more rapidly accomplished. Kalashnikoff found that in cases of relapse such regions as have been treated by heat either remain free from any rash or are affected in a strikingly slighter degree in comparison with other regions of the body. The beneficial effects of heat are attributed to its inducing cutaneous hyperæmia, accelerating the local circulation, raising the temperature of the blood, and modifying the condition of metabolism. According to Kalashnikoff, it is probable that, while promoting the absorption of syphilitic infiltrations, heat at the same time destroys the syphilitic virus itself. Care as to the fitness of the patient to this treatment and to the details of the latter should be exercised.

The efficient and energetic action of local heat in syphilis has been attested by Domashneff, Stepanoff, Fischer, Radestock, and others, and it should be borne in mind as an adjuvant remedy of reserve. But in its employment watchfulness and care are very necessary. I am fully in accord with Professor Tarnowski,[1] who, while admitting that heat applied externally can lead to a rapid absorption of cutaneous syphilides, emphatically objects to regarding their disappearance as being identical with cure of the disease. The truth is, probably, that external lesions are only displaced and driven to other parts of the economy, such as viscera, heart, arteries, brain, etc. Thus it should never be adopted as a method of cure, for it may be injurious or even dangerous. It may, however, in proper cases be employed moderately and carefully as an adjuvant to general methodical and local treatment.

Sublimate baths are very often of much benefit in extensive rashes of the skin. In cases of papular, scaly, tuberculous, or ulcerative syphilides these baths, at a temperature of 100° Fahr., are frequently the means of causing the prompt disappearance of the lesions. From 4 to 8 drachms of the sublimate may be used in the bath, to which also may be added double the quantity of chloride of ammonium or common salt. The baths should be taken at night, and the patient should remain in them from fifteen minutes to half an hour, the time being gauged according to the sensations produced by them. When strong sublimate baths are taken rather frequently, it is necessary to diminish or suspend the mercury taken by the mouth.

A watery solution of corrosive sublimate (1 to 3 grains to the ounce)

[1] *Vratch*, 1889, No. 5, p. 156, and No. 9, p. 238.

is often of much benefit when applied locally on lint or cotton as a compress for dermal lesions, periosteal swelling, onychia, etc. Detmold[1] recommends for external use a watery solution of corrosive sublimate (2 grains to the ounce) which he instructs patients to rub well upon each extremity, using half an ounce at an application night and morning. The results of this treatment were most gratifying, and Detmold resorts to it to the exclusion of all others. The application does not irritate the skin nor produce salivation, though it was thought that griping pains in the stomach were observed after its continued use. This treatment is by no means new, but it has been brought into prominence by Detmold.

Gargles of corrosive sublimate, varying in strength from 2 to 8 grains to 8 ounces of water, are often very beneficial in buccal and pharyngeal ulcerative lesions.

It is well to remember Van Swieten's liquid, for it is capable of extended use as a local application, and may also be taken internally. Its formula is as follows:

℞. Hydrargyri chloridi corrosiv.,	gr. ij;
Alcoholis,	fʒiij;
Aquæ dest.,	q. s. fʒiv.—M.

One tea-spoonful contains $\frac{1}{16}$ of a grain of corrosive sublimate.

This preparation is particulary adapted for local treatment of secondary and tertiary lesions about the head, face, and neck.

Among the curiosities of syphilitic therapeutics may be mentioned the electric-sublimate baths exploited by Ehrmann and Gaertner.[2] These baths contain three drachms of sublimate, which salt, it is thought, enters the system by means of an electric current of an intensity of 200 milliampères. The baths are given every day or every second day, and should be of half an hour's duration, though the current is only to be kept on for fifteen minutes. The authors of this method of treatment claim—1st, that the introduction of mercury takes place in the same way as when inunctions are used, and that the stomach and liver are spared; 2d, that absorption takes place by almost the whole surface of the skin, upon which the mercurial also exerts a local action; 3d, that the quantity of mercury absorbed is proportionate to the intensity and duration of the current, and that exactitude of dose is thus made possible; 4th, that it is painless and without danger. Under this treatment the urine shows the presence of mercury after sixteen to thirty baths; hence absorption is not rapid. After a time it was found

[1] "Diagnosis and Treatment of Syphilis," *Med. News*, March 8, 1884.

[2] "Le Bain electrique au Sublimé, experience sur un Nouveau Traitement mercurial," *La Semaine médicale*, 1889, p. 438; and "Du Traitement de la Syphilis par les Bains electriques au Sublimés," *Ibid.*, 1890, p. 357.

that the system did not take up any more mercury. Toxic effects, such as diarrhœa, salivation, and scaling eczema, were noted in a few cases.

Another method of treatment of syphilis has been proposed by Brémond[1] which is claimed to be successful when other methods fail. The patient is placed in a box with his head out, and a sprayer projects at him, all over his body, numerous jets of steam containing particles of sublimate or iodide of potassium.

Local, Special, and Regional Treatment.

Treatment of Chancres.—When seen at a very early date upon the male genitals, the chancre usually appears like a minute round or oval excoriation, or as a papule with a scaly or an oozing surface. So much does this, the earliest of all evidences of syphilis, resemble simple benign lesions that mistakes are very liable to occur, and a chancre may be diagnosticated as an excoriation, an abrasion, or as a simple inflammatory papule, or *vice versâ*. Under these circumstances the physician cannot be too careful and guarded in the diagnosis of any seemingly insignificant lesion upon the penis. It is well to warn a patient not to indulge in sexual intercourse for at least two weeks, by which time the nature of the lesion will be beyond question, since if it is benign it will commonly heal under simple treatment and cleanliness, and if it is an incipient hard chancre its evolution will continue and its appearance will indicate its character. It is of the utmost importance that no stimulating or escharotic applications should be made to these small lesions, for very good and sufficient reasons. In the first place, if the lesion is simple in nature, burning it with acid or other caustic will not destroy it, but simply transform it into an inflammatory nodule, which may present a striking resemblance to a young hard chancre, and thus doubt and uncertainty of mind are induced or an error in diagnosis is the result. If the lesion is an incipient chancre, it is a localized specific neoplasm, which cauterization, however severe, cannot possibly destroy, but it can cause a complicating œdema which may be troublesome to cure. Therefore it may be stated as a golden rule that we must not lay violent hands on these seemingly and perhaps insignificant lesions. Any breach of surface, therefore, should be kept scrupulously clean by washing, and its surface may be covered with lint or absorbent cotton moistened with water. In many cases a water dressing is sufficient, but mild solutions of sublimate (1 to 1000, 2000, or 3000) may be applied, or very dilute watery solutions

[1] "Traitement, de la Syphilis par l'Absorption cutanée des Medicaments," *La Semaine médicale*, 1889, p. 284; and "Traitement de la Syphilis aux Diverses periodes de la Maladie, par l'Absorption des Medicaments par la Peau," *Journal des Mal. cutan. et Syphilis*, vol. i. 1890, p. 297.

of carbolic acid. These applications may be made every two, three, or four hours. Peroxide of hydrogen 1 part and water 6 parts make a solution which will produce an antiseptic effect. As the hard chancre grows larger it may be treated with black wash, with yellow wash, or the red wash which is made as follows:

℞. Zinci sulphatis,	gr. viij;
Spiritus lavandulæ comp.,	ʒij;
Aquæ,	q. s. ad ʒiv.—M.

It must be understood that the therapeutical effect of these lotions is simply protective and slightly stimulating. They prevent irritation and ulceration by keeping the parts clean and aseptic. The chancre offers a nidus for pus-producing microbes, and when it is not large antiseptic washes are all that is required in the way of treatment.

Petersen[1] has used a solution of yellow and blue pyoktanin of Merck (1 to 1000, or even 1 to 100) upon hard and soft chancres, and he claims that he has had good results. The chief advantages are that it is inodorous and in antiseptic power not inferior to iodoform. The stain of blue pyoktanin may be removed from the hands by washing them well with a strong soap-lather and, after drying, pouring alcohol over the spots. Dr. E. R. Palmer of Louisville informs me that he has employed with much satisfaction, in the treatment of hard and soft chancres, a watery solution of fuchsine (1 drachm to the ounce), which he paints well over the morbid surface, which he then covers with absorbent cotton.

Chancres covered with a false membrane, thick or thin, those which show a tendency to become necrotic upon their surfaces, or in which a decided tendency to ulceration is seen, may not be sufficiently influenced by the foregoing applications. In these cases it is important that a decidedly caustic effect should be produced. In cauterizing hard as well as soft chancres carelessness and recklessness must be carefully avoided. The lesion to be treated should first be carefully washed with soap and water, and then irrigated with a 5 per cent. carbolic solution. Then it should be dried and a solution of cocaine applied to it, and then it should be dried again. We no longer use the carbo-sulphuric paste (sulphuric acid and charcoal) nor the Vienna paste (chloride of zinc and flour), for they are difficult of application and too caustic in their effects. Cauterization by heat is repugnant to patients and not necessary. As a routine application nothing is better than fluid carbolic acid or pure nitric acid. These agents should be sparingly, carefully, and not frequently applied to the surface of the sore,

[1] "Die Desinficirende Wirkung der Anilinfarben von Merck Pyoctanin," *St. Petersburg med. Wochenschrift*, No. 27, 1890.

and not beyond it. A small quantity of cotton rolled on the end of a wooden toothpick offers the most effective and satisfactory means of application. It may be well to mention that Güntz[1] of Dresden advises the use of concentrated muriatic acid, after which he covers the surface with a little bicarbonate of sodium, and then applies cold compresses. In case the surface cauterized is quite large, it is well to send the patient at once to his room, where he should lie down. It is well to bear the fact in mind that this destructive treatment is only indicated in cases in which the surface of the sores is unhealthy and shows no tendency to heal. After cauterization it is necessary to apply antiseptic remedies in the powder form. It is always imperative that these lesions should be carefully washed twice a day, and the patient should be warned to destroy, preferably by fire, all linen used in the cleansing, and to be careful not to touch with soiled fingers any article which others may handle. Among antiseptic powders iodoform still holds its position without a peer or rival. New remedies come and go, but this one stays by us. It may be said without fear of contradiction that for the dressing of ulcers and wounds about the genitals, male and female, there is no remedy so efficient or which has such a wide range of usefulness. Its odor is of course objectionable, but with care much of this inconvenience may be obviated. In the first place, the powder must be very carefully and sparingly put on the surface, and not allowed to drop on sound parts or upon the clothes. Then, if the lesion is under the prepuce, the odor may be kept at a minimum by packing cotton in the preputial orifice. If the lesion is on an uncovered part, it should be enveloped in absorbent cotton and then covered with gutta-percha tissue. A little care and ingenuity will do much to dissipate a patient's disinclination or repugnance to the use of this drug. Though many drugs have been recommended as having the power of deodorizing or disguising the odor of iodoform, none, in my judgment, have proved successful. By far the best deodorant is cumarine, which in small quantities may be added to iodoform. It must always be remembered that this powder is only applicable to unhealthy and necrotic surfaces, and that when a smooth healing surface has been produced its use must be discontinued and one of the simple stimulating or antiseptic lotions or powders should be substituted.

Iodol has now been on trial a number of years, and has proved itself to be a feeble agent, comparable in its effects to subnitrate and subiodide of bismuth. Where little is required it may be used and may prove satisfactory, but in severe cases this powder forms a crust over the surface, and beneath this the destructive process goes steadily on. When there is danger ahead never trust to iodol. Aristol is scarcely

[1] *Die Behandlung der Syphilitischen Geschwüre nach den Neuren Methoden*, Leipsic, 1891.

more efficient in really active lesions than is iodol. There are those who *see* good effects in every new preparation, but they are usually not careful and critical judges. The fact that aristol will act seemingly favorably upon a chancre whose course is attended with slight ulceration and destruction is no evidence that in a graver exigency it will prove efficient. In my experience (and I have tried it extensively) aristol has shown no decided therapeutic power, certainly none more marked than that shown by iodol, subiodide of bismuth, sub-benzoate of bismuth, and other such powders. Though it is odorless, it leaves an objectionable sticky feeling on the fingers and on the parts to which it is applied. If you have a bad case, be sure to use iodoform; and if you have a mild case that any indifferent powder will help, prescribe iodol, aristol, or some other new remedy. If you do nothing else, you will show that you are progressive and that you keep abreast of the times, and among some that will have its effect.

Many chancres in a necrotic state will be much benefited by the application of calomel covered with cotton. Salicylate of mercury has been recommended for this purpose, but it should never be applied in its pure state, for it exerts an unpleasant irritant and destructive action upon the mucous membrane. It may be combined with talcum powder or starch in the proportion of 1 drachm of the mercurial to 4 or 6 drachms of the inert powder. Salicylic acid is uncertain in its effects, and if applied in its purity causes irritation.

The cup of happiness of the seeker after therapeutic novelties must certainly now be nearly full, for every month brings us a new antiseptic remedy, usually from Germany, which is to supplant iodoform. In order that I may not appear behind the times, I will enumerate these new remedies and their sponsors, so that anyone can put them to a practical test:

Bazilivitch[1] claims that he has had excellent results in ulcerated chancres by freely powdering their surfaces twice a day with antifebrine (Merck). He further claims as advantages that it is cheap, free from odor, and will not give rise to dangerous phenomena from absorption.

Salol has also been extolled by Salsotto[2] and others in the treatment of hard chancres, but the drawback to its use is the fact of the difficulty of obtaining it in sufficiently fine powder that it will not act as an irritant. A combination of salol one part and some inert powder two parts may be of service in some mild cases of ulcerating chancres.

Sozo-iodol has been extolled by Lassar,[3] and it may do good service in some mild cases.

[1] *Meditzinskoïe Obozrenië*, Nos. 13 and 14, 1890.

[2] "Il Salol ed il su. uso terapeutico in alcuni morbi venerei," *Giornale Ital. del mal. Veneree e della Pelle*, 1887, p. 345, *et seq.*

[3] "Ueber das Sozoiodol," *Therapeut. Monatshefte*, Nov., 1887.

The subgallate of bismuth, also called dermatol, has been proposed by Heinz and Liebrecht[1] as a substitute for iodoform. They claim that it has decided healing properties and that it is inodorous and non-poisonous. An extended use of this has not so far been made, but C. A. Powers[2] at the New York Hospital up to date thinks that it is as efficient in healing ulcers as iodoform. It will be interesting to learn what he thinks of the remedy a year or two hence.

Sansoni[3] of Turin, among other remarkable qualities, claims that euphorin (Merck) is better than any other remedy as an application to obstinate ulcers. I suspect that within a short time we shall have some highly laudatory accounts of the effect of this agent in the cure of chancres.

Europhen, introduced and recommended by Goldmann,[4] is said to have a brilliant future before it as an antiseptic.

And, lastly, sulfaminol (Merck) comes before us as an inodorous, painless, anti-suppurative remedy, which Robertson[5] regards as superior to iodoform. It has not as yet been used in the treatment of chancre.

It must not be forgotten that the main benefit of all antiseptic remedies for chancre consists in their power of preventing ulceration, and by this means they hasten the cure. It is important, however, that a specific action should be brought to bear on all chancres which show a tendency to become indurated. Having by the proper means produced a healthy surface, the chancre should then be treated with mercurial ointment. The surface having been washed and rendered as nearly as possible aseptic, a layer of absorbent cotton or lint well smeared with this ointment should be placed upon it, and then kept in constant apposition. It is important that the dressing should be renewed two or three times a day.

Chancres of women require the same general treatment as is used for those of men. In many cases they run their course and disappear without treatment, and perhaps without recognition. In some cases, however, they are obstinate and persistent, and require time and care for their removal. It is always imperative that the vagina and vulva should be kept particularly clean in women having syphilitic chancres. They should use frequent irrigations of hot water to which borax, alum, sulphate of zinc, or carbolic acid is added. Then the parts should be kept as dry as possible, for which purpose tampons of absorbent cotton are very effective. In some cases extensive and troublesome indurating œdema becomes a complication of the vulvar chancre, and its presence

[1] *Berliner klinische Wochenschrift*, No. 24, 1891.
[2] *Medical Record*, October 17, 1891.
[3] *Therapeutische Monatshefte*, Sept., 1890.
[4] *Pharmaceut. Zeitung*, July 15, 1891.
[5] *British Med. Journal*, August 29, 1891.

means a long siege of annoyance and perhaps suffering. When possible, chancres in the female should be dressed with mercurial ointment in the manner above described. If the induration is extensive, or if it shows a tendency to spread, it is well to cover the chancre and a liberal area of the parts around it with the ointment. In some cases a strong calomel or white precipitate ointment may be used in place of the mercurial ointment.

Treatment of the Syphilides.—ERYTHEMATOUS SYPHILIDE.—As a rule, internal medication causes this syphilide to disappear promptly, but it is always well to hasten its involution by sublimate baths, mercurial vapor baths, or by inunction. Upon the face, neck, hands, and wrists this syphilide may be persistent, and its disappearance may be hastened by using the following ointments:

℞. Hydrargyri ammoniati *vel* hydrargyri oxidi rubri,	gr. xx;
Unguent. aquæ rosæ,	℥j.—M.

℞. Hydrargyri subsulph. flav.,	ʒss;
Vaselini,	℥j.—M.

The latter is much thought of by Mauriac. In some cases of persistent eruption about the face the following lotion may be used:

℞. Hydrargyri chloridi corros.,	gr. iv;
Aquæ cologniensis,	ʒij;
Aquæ,	ad ℥iv.—M.

Apply three or four times a day.

The erythematous syphilide is not uncommonly complicated by a seborrhoic process, as shown by the development of orange-red patches of scaly skin upon those parts of the forehead, glabella, alæ nasi, and around the mouth, on which the sebaceous and sudoriferous glands are most abundant. This condition is also found on the scalp and upon the sternal region. For these cases resorcin in liquid or ointment form is very efficient. The following ointment may be used, after well washing the parts with the simple tincture of green soap (tinctura saponis viridis):

℞. Resorcin.,	ʒss–ʒj;
Acidi carbolici,	gtt. xx;
Unguent. aquæ rosæ,	℥j.—M.

THE PAPULAR SYPHILIDES.—These eruptions are usually amenable to internal medication if they are attacked early. But even if internal treatment is ordered, one or other of the external methods should be used occasionally, in order to expedite their involution. The small

and large miliary papular syphilides are the ones which are most resistant to remedies general and local. They, like all stubborn papular syphilides, should be treated by hot baths, either alkaline or sulphur, and by frictions of mercurial ointment. Massage has recently been recommended by Balzer[1] as an adjunct in the treatment of these syphilides. Mercurial ointment is to be rubbed into the surfaces firmly and deeply, each seance occupying from twenty minutes to half an hour. I have used this method of treatment for many years, and have long since become convinced of its efficacy and necessity in many cases. In some cases of extensive pigmentation following syphilitic eruptions baths and massage treatment have been followed by striking results. Scaling eruptions of the palms and soles, the sequelæ of the erythematous and papular syphilides, are peculiarly obstinate and prone to relapse. They may be benefited by local sublimate baths, as recommended by Sigmund, and, more recently, by Gilles de Latourette.[2] Hot alkaline baths with the addition of bran are also very efficient. After immersion of the parts they should be enveloped in a mild form of mercurial ointment, as follows:

℞. Unguent. hydrargyri nitratis, ℥ij;
Olei rusci, ℥j;
Unguenti, ℥j.—M.

℞. Unguent. hydrargyri nitratis, ℥ij;
Olei cadini, ℥j;
Vaselini, ℥j.—M.

℞. Hydrargyri ammoniati *vel* hydrargyri oxidi rubri, gr. x–xxx;
Olei rusci, ℥j;
Vaselini, ℥j.—M.

Such is the inflammatory condition present in some cases that a soothing ointment is required, as follows:

℞. Unguent. diachyli (fresh), ℥ij;
Unguent. hydrarg. nitratis, ℥j;
Olei rusci, ℥ss.—M.

In some cases of localized eruption a mild solution (from 1 to 4 grains to the ounce) of bichloride of mercury in flexible collodion or traumaticin may prove very efficient. Sometimes, when the tendency to scaling is very great and persistent, chrysarobin may produce happy results.

[1] "Contribution à l'étude du Traitement local des Syphilides; Utilité de Massage," *La France médicale*, Jan. 9, 1891, p. 18, *et. seq.*

[2] *Progrès médical*, June 10, 1886.

CONDYLOMATA LATA.—These lesions are found around the genitals of the male and female, in the axillæ, under the breasts of fat women, in the labio-nasal sulcus, and about the umbilicus. They are large, flat, overgrown papules, with excoriated oozing surfaces and a tendency to great multiplication and to exuberant development. In their very early stages, when not very salient, simple washing with carbolic water, dusting with an inert powder, and covering with absorbent cotton will cause them to flatten and disappear. In general, the old Ricord treatment is to-day unexcelled. By this the parts are carefully washed with a solution of chlorinated soda (Labarraque's solution 1 part, water 6 or 8 parts), dried, dusted freely with calomel, and covered with cotton. Keeping the surfaces of these lesions dry by the covering or interposition of some soft cotton or linen fabric materially assists in causing their early involution and prevents their further reproduction.

When these lesions are not very much elevated their subsidence may be hastened by carefully applying to their surface once a day, after washing with soap and water, a solution of nitrate of silver (30 grains to the ounce). It is unwise to treat them with the nitrate of silver stick, for by doing so much dermatitis may be produced and the cure much delayed. Powders of resorcin or salicylic acid with starch and boric acid are also serviceable in these cases.

In hospital and dispensary practice we frequently encounter cases in which condylomata lata have become much hypertrophied, and perhaps exuberantly fungating. In these cases the foregoing measures are ineffectual, and more heroic treatment is required. In this event the parts, after careful washing and drying, may be painted with either of the following solutions:

℞.	Hydrargyri chloridi corros.,	gr. x–xx;
	Collodii flex.,	℥j.—M.
℞.	Acid. salicylic.,	ʒss–ʒj;
	Chrysarobin,	ʒss;
	Collodii flex.,	℥j.—M.

On the Continent, and largely in Germany, Plenck's solution is much used in these and other hypertrophic syphilitic lesions. The formula is as follows:

℞.	Hydrargyri chloridi corros.,	℥j;
	Aluminis,	℥j;
	Plumbi acet.,	ʒj;
	Camphoræ,	ʒj;
	Alcohol.,	f℥xij;
	Aceti,	f℥xij.—M.

This makes a solution with a decided sediment, and on shaking it turbidity is produced. It may be applied with a camel's-hair pencil, after proper preparation, to these lesions. It should not be used unless the application can be followed by cold compresses, for it may produce pain. It is therefore more especially a hospital remedy. Hoffman[1] reports the case of a woman having condylomata about the genitals and anus, which were cauterized by a physician who threw away the supernatant liquid from Plenck's solution, and used the turbid sediment. On reaching home the woman suffered atrocious pains, rolled on the floor in agony, and unsuccessfully tried to hang herself. At the hospital, later, it was found that the parts were much inflamed and swollen, and the woman was suffering from abdominal pain, vomiting, and diarrhœa. After eight days' suffering she died. These facts should certainly act as a warning in the use of very caustic mercurial remedies on these highly vascular lesions. Kaposi[2] thinks that Plenck's solution should be discarded, and that emplastrum hydrargyri should be substituted for it. But in many cases this plaster cannot be applied. So that Koch's[3] suggestion, that the remedy be retained and used in diluted form, is wise, for this solution sometimes acts well when other applications fail. It certainly never should be used after decanting its supernatant liquid. Though Hallopeau[4] has recently recommended (and his paper has been largely quoted) the use of the acid nitrate of mercury in the treatment of anal condylomata, it must be remembered that it is a very caustic and very concentrated mercurial solution, and that cauterization by it of a simple small ulcer on the os uteri has been known to cause salivation. If used at all, the greatest caution should be observed, and only a small surface should be touched with it.

I have seen much benefit, in some instances of large and not closely aggregated condylomata lata, from the free but careful use of the curette, the operation being followed by thorough antisepsis. For a limited number of cases this treatment may prove effective.

A more radical procedure is one recently advocated by Baudier,[5] who used it largely in Leblond's service. It consists in the application of the thermo-cautery to large and persistent condylomata. I have long employed this method in rebellious cases, and with prompt and good results. But great care must be taken in the application. The parts must be thoroughly cleansed, and the hot instrument passed

[1] "Sublimat Vergiftung nach Aetzung von Kondylomen mit Solutio Plenckii," *Wien. klin. Wochenschrift*, No. 16, p. 301.

[2] *Ibid.*, No. 19, p. 361. [3] *Ibid.*, No. 33, p. 641.

[4] "Des Antiseptiques locaux dans le Traitement de la Syphilis," *La France médicale*, Oct. 3, 1889, p. 1362, *et seq.*

[5] "Du Traitement des Plaques Meuqueuses Hypertrophiques persistentes chez la femme," *Thèse de Paris*, 1888.

lightly several times over the surface. If the burning is too severe, trouble in healing will be experienced and annoying cicatrices will be produced. The patient should be under the influence of an anæsthetic, or cocaine should be applied to the lesions and also injected in close proximity to them.

Should chromic acid be used, the operator must remember that he has a very treacherous remedy, which may seemingly not penetrate deeply, and yet may lead to much destruction of tissue, and suffering.

The tincture of chloride of iron may often be used with comfort and benefit in these cases. The officinal tincture of iodine and a preparation of double strength are also very serviceable in some of the less pronounced cases.

Pustular, Encrusted, and Serpiginous Syphilides.—The early and intermediate pustular syphilides require sublimate, mercurial vapor, and sulphur and alkaline baths. Then the patient's body should be rubbed with mercurial ointment or a strong white precipitate ointment. About the face it is imperative that these lesions should be efficiently acted upon, in order to cause their prompt disappearance and to prevent cicatrices. For this purpose the following ointments may be used:

℞. Zinci oxidi,
Pulv. amyli, *āā* ʒij;
Unguent. hydrargyri (freshly prepared),
Vaselini, *āā* ʒss.—M.

℞. Hydrargyri ammoniati, gr. xxx;
Zinci oxidi,
Pulv. amyli, *āā* ʒij;
Vaselini, ʒss.—M.

Resorcin, 1 drachm, may be substituted for the white precipitate in cases in which there is a seborrhoic complication.

The encrusted syphilides require the use of baths and fomentations for the removal of crusts, and then calomel or iodoform may be dusted upon the raw surfaces, which should be covered with absorbent gauze. When these surfaces are extensive iodoform should be used sparingly, lest it produce a toxic effect, or it may be mixed with an equal quantity of subnitrate of bismuth and then applied more freely.

The serpiginous syphilide is sometimes very obstinate in its course, ordinary treatment failing to prevent its extension. Under these circumstances free but careful curetting, after removal of crusts and disinfection, as found beneficial by Spillmann[1] in five cases, may prove remarkably efficient. I have seen one such application promptly cause

[1] *Progrès médical*, Sept. 5, 1885.

the healing of a case which had been rebellious for many months. A similar procedure may be beneficial in some cases of extensive rupia after the removal of the crusts and the laying bare of a well-marked fungating surface. Some raw surfaces left by ulcerating syphilides show a tendency to exuberant fungating growths. When not sufficiently well marked to require the curette, they may be carefully touched with carbolic or nitric acid, after the manner laid down for the treatment of chancre.

Gummatous Syphilides.—The early or precocious gummata indicate the necessity for the use of the mixed treatment, or of iodide of potassium in combination with mercury applied locally. Daily inunctions should be made, and mercurial ointment spread on lint should be bound upon the parts. If much pain is present belladonna ointment may be mixed with the mercurial ointment.

In their non-ulcerated state late gummata may be treated in the manner just now described. When ulceration is active it may be necessary in some cases to scrape away the base and the margin. The necrotic membrane which is so commonly seen in these ulcers should be treated with compresses of sublimate solution (1 to 500, 1000, or 2000), or with compresses of carbolic-acid water (5 per cent.). The application of carbolic acid or nitric acid may be necessary. When the slough or membrane on the surface of the sore is not very dense or adherent, iodoform may be dusted upon it. When a raw surface has been exposed the application of a mild mercurial ointment with the addition of some balsam of Peru (1 drachm to the ounce) will usually cause prompt healing. In very large and deep gummatous ulcers, after dusting with iodoform, sterilized sand may be freely packed in and retained by absorbent gauze and bandage.

Tubercular Syphilides.—These, when of the non-ulcerative variety, should be treated in the manner indicated for papular syphilides. Being late and deep lesions, they require the administration of both mercury and iodide of potassium. To cause their involution mercurial baths and sublimate baths may be employed. Each tubercle should receive very vigorous friction with mercurial ointment, which when practicable should be kept in constant contact with the lesion. In some cases mercurial plasters may be very efficacious. Scaling conditions of the skin left by this syphilide require a similar treatment to that of the scaling sequelæ of the papular syphilides.

Treatment of Affections of the Hair.—In the early months of syphilis the hair may fall out in numerous large or small patches, or there may be a general thinning of the hair over the whole scalp. It is very important that local treatment should be promptly instituted. If possible, the hair should be cut short at once; then the scalp should be thoroughly cleansed and moistened twice a day with a solution of subli-

mate (1 to 1000). If any erythematous papular or pustular lesions are present, calomel or white precipitate ointment may be rubbed into the skin once a day. When there is a seborrhœal complication, the following ointment will prove beneficial:

℞. Resorcin., ʒj;
Balsam. Peruvian., ʒj;
Vaselini, ℥j.—M.

As a stimulant to the scalp, for use every night, the following prescription will prove valuable:

℞. Tinct. cantharid., ℥j;
Tinct. capsici, ℥ss;
Aquæ cologniensis, ʒij;
Aquæ, ℥iv.—M.
To be well rubbed into the scalp by means of a sponge.

In very obstinate cases stimulation of successive patches by the application of pure liquid carbolic acid or of cantharidal collodion may be tried. The nutrition of the patient must be improved as much as possible, and tonics must be given with the internal mercurial remedy.

Treatment of Affections of the Mouth.—It is well to repeat here what has already been said—namely, that continuous care must be exercised regarding the condition of the mouth, particularly in the first year of syphilis. Excoriations of the tongue may be touched with a solution of nitrate of silver (10 grains to the ounce), and the mouth rinsed with a solution of chlorate of potassium, of borax, or of alum. In many cases the application of a solution of chromic acid (from 10 to 30 grains to the ounce) will heal some patches. Mucous patches of the cavity of the mouth and pharynx may be sprayed every few days with a solution of nitrate of silver (20 grains to the ounce), and the mouth rinsed frequently with Dobell's solution or with the following gargles:

℞. Sodii borat., ʒiij;
Tinct. catechu,
Tinct. myrrhæ, āā. ℥ss;
Aquæ, ℥vij.—M.

℞. Argenti nitrat., gr. xxiv;
Listerine,
Glycerini, āā. ℥ss;
Aquæ, ℥vij.—M.

℞. Hydrargyri chlorid. corros., gr. ij to viij;
Tinct. myrrhæ, ℥ss;
Aquæ, ℥viiss.—M.

This sublimate gargle is very efficient in its action. It may be used in a mild form for ordinary cases, but those attended with severe symptoms require the strong solution. When the latter is used patients should be warned not to swallow any of it. Recently black wash has been highly extolled by Dr. C. H. Griffin[1] as a gargle for mucous patches and syphilitic ulcerations of the throat. In the few cases in which I have tried it private patients have complained that it was nauseous to them. At the Vanderbilt clinic we have found its action beneficial.

A treatment said to be new, but really a modification of the old-time Corbel-Lagneau mercurial pastilles, has recently been recommended by Crequy.[2] The formula of these pastilles is as follows:

℞. Hydrarg. iodidi virid., gr. ¾;
Potassii chlorat., gr. iij;
Potassii iodidi, gr. ¾;
Chocolatæ, q. s.—M.
Ft. in tabellam No. I.

One or two such tablets a day may be allowed to dissolve in the mouth.

Gummy infiltration into the the soft or hard palate or into the pharyngeal walls requires the prompt institution of a strong mixed treatment, or the employment of friction upon the neck and the ingestion of full doses of iodide of potassium. Beginning with 10 or 15 grains three times a day, the dose should be increased 5 to 10 grains every day. Prompt active treatment will frequently arrest the morbid process, and thus spare much destruction of important tissue. Locally, solutions of nitrate of silver by spray may be used, and if there is an ulcerated surface, iodoform by insufflation or in suspension in glycerin should be used. In many cases the strong bichloride gargle will prove beneficial. It is well to remember the old Ricord gargle, composed of iodide of potassium, tincture of iodine, and water, for it is often very beneficial.

Treatment of Affections of the Nervous System.—The early supervention of symptoms referable to the cerebro-spinal system in many instances necessitates the precocious use of the iodide of potassium. Syphilitic headaches will frequently be found to be very persistent and rebellious to treatment when mercury is given by the

[1] *Medical Record*, Sept. 22, 1891.
[2] *L'Union médicale*, 1891; and *Medical News*, April 24th, 1891.

mouth. I have seen in consultation many such instances, where the use of pills has been pushed to the extreme of intense salivation, and yet the nocturnal headaches persisted. In some few cases calomel, in doses of $\frac{1}{5}$ or $\frac{1}{4}$ grain every three or four hours, may prove beneficial, but the danger of salivation is always to be feared if its use is at all prolonged. Mercurial inunctions into the neck and temples will usually prove very beneficial, and synchronously iodide of potassium in increasing doses should be given.

Any affection of the cerebro-spinal system occurring in the early years of syphilis should be treated by mercury, either administered by inunctions, made as near the head as possible, or by hypodermic injections, two or three of which may be given in the neck. At the same time iodide of potassium should be given internally. This remedy may be taken in milk, in Vichy water, and in cases of weak stomach may be combined with Fairchild's essence of pepsin, and also with bitter tonics. In some cases a dose of 30 grains three or four times a day will have the desired effect. In obstinate cases, however, the remedy must be pushed with a free hand until amelioration in the condition is produced or the obstinacy of the case shows that such disorganization has been produced by the syphilitic process that further improvement is hopeless. As much as 1 ounce or $1\frac{1}{2}$ ounces have been required in many cases to produce a cure. I am, however, firmly of the conviction that when mercury is synchronously administered, as it certainly should be even in advanced cases, it will seldom be necessary to push the iodide as heroically as has been done in the past.

Besides the essential treatment here succinctly outlined, much treatment directed to concomitant and consecutive symptoms and conditions will be required, and should be instituted according to the indications presented.

Treatment of Gingivitis, Stomatitis, and Salivation.—A patient under mercurial treatment should be, as before stated, carefully watched as to the condition of his mouth, throat, and nose. When there is any tendency to hyperæmia of the mouth and throat, free gargling three or four times a day with solutions of chlorate of potassium and alum, of common salt, or of borax should be used. When patients are undergoing an inunction cure, particularly, it is well to wash the mouth three or four times a day with strong alum-water or with a solution of alum and acetate of lead, as follows:

℞. Pulv. aluminis,	ʒiij ;
Plumbi acetatis,	ʒss ;
Aquæ,	℥viiss.—M.

The first signs of irritation of the gums should cause a diminution of

dose or a suspension of treatment and the adoption of local therapeutics. In any and all cases of mercurial action upon the mouth the physician should be very conservative in the use of caustic applications. For mild cases of gingivitis the application by a brush of equal parts of tincture of myrrh and tincture of iodine once a day, followed by some mild mouth-wash, will usually be all-sufficient. When the case is severe, and the tissues of the mouth and throat are very much inflamed and swollen, frequent rinsings with very warm solutions of borax and alum to which listerine and glycerin are added are very soothing. Once or twice a day it may be necessary to use as a mouth-wash and gargle a solution of the nitrate of silver (4 to 8 grains to the ounce). Much benefit often follows rinsing the mouth with a solution of bichloride of mercury. For this purpose Von Swieten's solution, either in its purity or diluted, will prove very efficacious. It is thought by Galippe, Renzie, and others that much of the intensity of the mouth-inflammation in mercurial poisoning is due to the activity of microbes, which are so numerous in the mouth, and that by its antiseptic action the bichloride is very efficient in these conditions. Patients thus suffering should be well nourished by means of nutritious broths and sarco-peptones, and should take quinine freely. They should be kept in the fresh air as much as possible. Much benefit and comfort may be derived from the application of a solution of cocaine to ulcerated surfaces. The judicious use of hot baths will aid in the elimination of the mercury from the system.

Treatment of Hereditary Syphilis.

Though the treatment of hereditary syphilis is very similar in many particulars to that of the acquired disease, it presents many divergencies and difficulties, and is not followed by such uniformly good results as are obtained in adults. Children born syphilitic are in various degrees tainted through and through with the poison, consequently the physician is at the outset brought face to face with malnutrition and a tendency to decay. He really has little, if anything, to build upon. In this fact lies the great difficulty in treating the victims of hereditary syphilis, and to it largely are due the many failures of our therapeutics. In acquired syphilis, as a rule, the evolution is tolerably orderly, and the lesions as they appear give indications which guide us in their cure. In hereditary syphilis, however, there is no order, and many of its manifestations are wrapped in obscurity and doubt. Thus it may be that we find bone and articular lesions present, with those of an exanthematic character seated on the skin. In some cases no skin lesions are present, while affections of the mucous membrane may exist, and then be in a doubtful and masked form. In other cases the evolution of lesions and various affections is early and prompt, and their general

physiognomy may point to their nature. Then, again, in lesions equally precocious there may be no decided features. Consequently, doubt and uncertainty as to their simple or specific nature may exist. This remark applies to ill-defined early eruptions and to affections of the mouth and nose, which, though caused by syphilis, resemble simple affections.

Further, the evolution of hereditary manifestations may be much delayed, so that the suspicion of their specificity is forgotten or not entertained. Thus we may see delayed cutaneous and mucous eruptions which are atypical and cause much perplexity of mind.

As a rule, the treatment of acquired syphilis is progressively orderly, while that of the hereditary disease is very often begun in doubt and uncertainty, and throughout its course subject to all manner of changes and modifications. A condition requiring mercury to-day may be replaced by the necessity to use iodide of potassium within a week, and *vice versâ*. Consequently, no specific data can be laid down for a general methodical treatment of hereditary syphilis. It is incumbent, therefore, upon the physician to watch his case continuously, and always to be ready with such measures of relief as may be indicated by the existing lesions.

It must be clearly understood by the physician, and as clearly presented to the parents or guardian, that, as a rule, at least one year and more—generally two—are necessary for the treatment of a syphilitic infant. The disappearance of one crop of manifestations merely means that one stage of the disease has been auspiciously passed over. We must then keep on in order to prevent or attenuate the severity of later outbursts. It is always well, however, to temper the activity of treatment by proper intermissions.

We will first consider the question of the treatment of the pregnant syphilitic mother; then the expediency of treating the child through the medium of a medicated mother or nurse; and then we shall come to the subject proper—namely, the treatment of hereditary syphilis in its various forms.

The Treatment of the Pregnant Syphilitic Mother and its Effect on the Fœtus.—An important question in the therapeutics of hereditary syphilis is the management of the case of the pregnant mother. On this subject the views of the profession are far from being clear and sharply formulated, and while we find some who recommend that the mother should be treated on her own account and also as a prophylactic measure for her offspring, others are in a state of doubt as to the wisdom and probable beneficial outcome of such a course, having an ill-defined fear that harm may thereby come to both. It is necessary, therefore, that this question should be studied in the light of the accumulated knowledge of to-day.

When it is possible the physician should endeavor to prevent the marriage of a syphilitic, male or female, until he or she shall have had a well-regulated general methodical treatment for at least two or two and a half years. At the end of that time, if their condition warrants it, they may marry. Some authors plead for a longer period of time, but I am fully convinced that in favorable cases treatment followed on the lines indicated will fit patients to marry and to produce healthy offspring. I have seen scores of infants born under these circumstances who have been healthy and strong. In very many cases, however, syphilitics will marry in spite of the physician's remonstrance, and a vast number marry who either do not know or do not realize the gravity and danger of their position. So that whatever the profession may do in trying to prevent the procreation of syphilitic children, these weakly and miserable specimens of humanity will come into the world, and their treatment during their gestation and after birth will be a source of solicitude and a tax upon the therapeutic resources of the medical profession.

In this connection let us briefly consider what is the effect of hereditary syphilis upon its victims. And to this end I can do no better than quote the carefully-prepared statistics of Fournier.[1] In his personal experience this observer found that in private practice more than two out of three hereditary syphilitic children died, either before, at, or soon after birth. In hospital practice Fournier found that out of 167 children born of syphilitic mothers, 145 died; which means that 1 child out of 7 or 8 survived. It having been claimed that Fournier's personal statistics made an exceptionally bad showing, and that they were exaggerated, he collected those from the whole world, his own excepted. He gathered the histories of 447 cases of children whose fathers or mothers were syphilitic, and found that out of this number there were 343 deaths, there being only 104 who survived. Of the 343 children who died, only 6 lived beyond the first year. The proportion of living children, according to these statistics, is 1 to 4.3.

The resources of the medical art certainly should be taxed to the utmost to reduce such an appalling death-rate.

Before proceeding to the question of the treatment of sypyilitic mothers, it is important to consider the part of the father as a factor in the causation of hereditary syphilis. It is now well known that men in the grasp of active syphilis very frequently procreate infected children whose mothers, unless infected by some active lesion, may remain free from the disease. Therefore it is the duty of the physician to explain to a syphilitic father that his disease is liable to infect his offspring, and to urge him to avail himself of all possible measures to rid himself of it.

[1] *La Syphilis héréditaire tardire*, Paris, 1886, p. 160, *et seq.*

The necessity of treating a syphilitic mother being therefore so obvious, the question arises, Can we treat such a mother without danger to herself, and will that treatment be beneficial to her and to her offspring? So many facts have been accumulated by so many observers in medical literature—notably, Massa, Garnier, De Blégny, Astruc, Petit, Fabre, Levret, Rosen, Underwood, Swediaur, Bell, Bertin, S. Cooper, Lagneau, Gibert, Cazenave, Cullerier, and Ricord—as to the wisdom and benefit to be derived both by mother and child from a well-ordered antisyphilitic course of treatment during pregnancy that I will answer the question and its subdivision emphatically in the affirmative. I know of no condition in the course of syphilis which more urgently demands an active and energetic but careful, watchful, and conservative treatment than does pregnancy in a syphilitic woman. Huguier and others thought that mercurial treatment predisposes a woman to more serious danger in abortion than if a simple treatment had been followed. Indeed, the idea was and is prevalent that mercury will produce abortion in pregnant women. If carelessly and unsparingly used, it may undoubtedly produce abortion and imperil a woman's life. But if the treatment is followed on the lines indicated in this article, no harm will be done and infinite good will certainly result. I am fully in accord with Sigmund,[1] who says that there is not the slightest danger to the mother or child by the use of a careful inunction treatment. By this means he has seen (and I can confirm his statement) living and healthy children brought into the world. As corroborative evidence I may here give Ricord's views, which, though old, are very apposite. He says: "The period of gestation in women, far from contraindicating energetic treatment, demands increased attention and promptitude within the bounds of prudence. I have seen very many more abortions among syphilitic women who had not been treated than among those who, taken in time, had been subjected to methodical medication."

A question so vitally important as the present one should be treated in the light of accomplished facts, and something more than mere statements should be offered. It is interesting, therefore, to know that the effect of mercurial treatment upon the pregnant syphilitic woman has been carefully and extensively studied under Sigmund's guidance and in his wards by Löwy[2] and Fonberg.[3] Löwy's observations go to show that by treating pregnant syphilitic women by inunctions abortion was reduced to 13.5 per cent., while in those not treated the ratio was

[1] *Die Einreibungs-cur mit grauen Quecksilbersalbe bei Syphilisformen*, Vienna, 1878, p. 103, *et seq.*

[2] "Beobachtungen au einen Reihe von Syphilitischen Schwangeren Welche der Einreibungs-cur unterzogen Werden," *Wiener med. Wochenschrift*, No. 39, 1869.

[3] "Statische Daten ueber Syphilis der Schwangeren mit Rücksicht auf Heredität und Behandlung," *Ibid.*, Nos. 49, 50, and 51, 1872.

29.5 per cent. After inunctions there were 75 per cent. of living children. His observations further prove that the treatment exerts no bad influence over the life of the mother and of the fœtus, and that it does not cause abortion or premature labor, and further, that it lessens the severity of the disease in both. In like manner, Fonberg found that the inunction treatment reduced the number of abortions from 28.5 to 14 per cent. He very wisely adds that a too energetic treatment may be injurious to mother and child.

Clinical observation has the support of a fact derived from careful chemical analysis. Cathelineau,[1] at Fournier's suggestion, made a careful analysis of the viscera of a fœtus whose mother was treated by inunctions. He found unmistakable evidence of mercury in the liver, heart, kidneys, and other organs as well as in the amniotic fluid.

These conclusions, the outcome of careful and extended observation and study, supported by the testimony of the observers mentioned, certainly should be accepted, and thus humane and beneficent medication should be administered to the pregnant woman.

Pregnancy, therefore, is an exigency in which, as shown on p. 36, the very early administration of antisyphilitic treatment is indicated. The management of syphilis in the pregnant woman requires of the physician skill, care, and watchfulness. As soon as the chancre is diagnosticated it should be treated carefully and efficiently. Lesions of any kind on the genitals of the pregnant woman indicate the necessity for great cleanliness. This is especially necessary when chancre is present. Therefore frequent mild antiseptic injections and ablutions should be made to the parts, in order to avoid any complicating inflammatory conditions. Then mercurial ointment on cotton or lint should be applied continually to the chancre. Throughout the course of gestation this antisepsis of the external genitals should be regularly followed.

It is important that the physician should have an accurate knowledge of the effect of the various preparations of mercury upon the pregnant woman, in order that he may adopt a proper treatment. There is no fact in syphilography more deeply engraved upon my mind than that of the utter futility of treating a pregnant syphilitic woman, and of endeavoring to prevent or render more mild the disease in the child, by the use of mercurial pills. I can look back, ten to twenty years ago, to many cases in which mothers thus treated were not at all benefited, often much inconvenienced and troubled, and in which no effect upon the syphilis in the child was produced. Many failures with the proto-iodide in this direction convinced me of its feeble powers, and my clin-

[1] Passage du Mercure de la Mère au Fœtus dans le Traitement antisyphilitique fait pendant la Grossesse," *Bullétin de la Société Française de Dermat. et de Syphilographie*, 1890, vol. i. p. 167, *et seq.*

ical results find their explanation in the experiments of Welander.[1] This observer found that by mercurial inunctions and hypodermic injections the drug was rapidly absorbed by the mother and transmitted to the fœtus, but that when pills of the protoiodide were administered the absorption was very slow and the action very feeble, owing to the smallness in quantity of the mercury absorbed. Therefore, in general it is a waste of time to treat a syphilitic woman either by the protoiodide, by gray powder, blue pill, the tannate, or any other preparation which is swallowed in pill form. Further than this, disaster may follow such a course. Many a man has thus treated a pregnant syphilitic woman and innocently imagined that he was doing all in his power for her.

It is well, therefore, to institute a systematic inunction treatment with all the precautions and safeguards spoken of in the section upon this branch of the subject. No pains should be spared in watching the woman to learn that all goes well and that the therapeutic effect is being obtained. In this way course after course of inunction should be given, with proper intervals of rest, during the whole period of pregnancy. If the treatment is carefully administered and the general condition and surroundings of the woman are favorable, there will be no trouble in keeping on to the end.

In like manner, if admissable, hypodermic injections of sublimate will be found of especial benefit. They should be given for a week or two at a time, in the retro-trochanteric regions principally. One very great advantage of the inunction and of the injection methods is that the stomach—so prone to rebel—and the intestines are spared.

But it often happens that objections to these methods are offered, and that the condition of the patient will not permit of their employment. On the principle that half a loaf is better than no bread, the physician may sometimes compromise matters and have the patient take a few inunctions for a time or a few injections, and then fill in the balance of the time by medicine given internally. He should make it very clear to the patient that if she can possibly use the inunction or submit to the injections for short periods and at odd times, she will be much the gainer.

Internally, the mixture of mercury and iodide, the formula of which is to be found on p. 60, may be given if stomach ingestion is found to be the most acceptable method.

The foregoing considerations concern chiefly early and active syphilis, in which condition mercury is especially indicated. In the case of women in later periods of syphilis, who are either the subjects of repeated abortion or whose children show evidence of hereditary taint,

[1] "Récherches sur l'Absorption et sur l'Elimination du Mercure dans l'Organisme humain," *Annales de Dermat. et de Syphilographie*, 1886, p. 412, *et seq.*

iodide of potassium in good-sized and perhaps increasing doses, combined with mercury, should be given with proper intermissions during the whole pregnancy. Pregnant women in an advanced stage of syphilis are greatly benefited by the iodide alone, but particularly in combination with mercury. The embryos of these women of course have a more advanced form of syphilis, and these drugs given to the mother exert beneficial therapeutic effects upon the child she carries.

In this connection it is well to remember the teachings of the case of Moreau,[1] which was that of a woman who, after several successive pregnancies always ending in premature birth and death of the fœtus, in despair as to the cause was submitted to an active syphilitic treatment, and who thereafter gave birth to healthy children at term.

As claimed by Dubois, Depaul, Moreau, Vidal De Cassis, and Putégnat, parents who procreate syphilitic children, even though they themselves may appear healthy and show no signs of the disease, should undergo a regular, methodical antisyphilitic treatment.

Indirect Treatment by Means of the Milk of the Mother or of the Nurse.—As early as 1699, Garnier proposed to treat syphilitic children by means of the milk of the mother or nurse, to whom mercury was being administered. This method is called "the indirect way of treating hereditary syphilis," and it has and has had many advocates, and perhaps as many opponents. It is a subject which often arises in the practice of medicine, and one concerning which few physicians have definite ideas.

The adoption of this treatment was really the outcome of the difficulties experienced in administering antisyphilitic treatment to young infants. The older physicians not only treated the mother or the nurse, but in the case of the absence or defection of either of these parties they caused the hair to be shaved off a female goat or ass, had the animal well rubbed with mercurial ointment, and then the child was made to nurse it, and thus simultaneously get sustenance and medication. Swediaur says that in one of the reigning families of Europe no child survived a certain age until this treatment was adopted. Though benefit was noted in many cases as following this treatment, it was claimed by some that no mercury, or only an insignificantly insufficient quantity, was conveyed by the milk, and that the seeming improvement in the child's condition was due to the auspicious course of its disease. Leaving aside the older analyses of milk from mercurialized women and animals, in some of which it was stated that mercury was found, and in others that it did not exist, we come to those of a later date. Thus, Kahler[2] resorted to very delicate electro-

[1] Lancereaux, *Traite historique el pratique de la Spyhilis*, Paris, 1873, p. 562.

[2] "Untersuchungen der Milch von Frauen während der Inunctionen," *Vierteljahr. für die Prak. Heilkunde*, vol. xxxii., 1875.

lytic analysis of the milk of women in whom mercury had been used so thoroughly that existing syphilitic lesions had been cured, yet no trace of mercury could be found. Still, he states that in certain cases in which no mercury was given to the children improvement followed their nursing a mother who was taking that agent by inunction. This fact has been observed over a long stretch of years, and I have seen many striking instances of it. On the other hand, Klink[1] of Warsaw, with the aid of Professor Tudakowski, submitted such milk to very delicate and elaborate tests, and found in that fluid a small but unmistakable quantity of mercury. In Klink's case also the child had derived benefit from the mercurialized milk. On this subject Welander[2] says: "I have only made three observations on the elimination of mercury by the milk. A woman who had taken only ninety pills of the protoiodide had mercury in the urine as well as in the milk. The urine of her child, which she nursed, and had received no other treatment whatever, also contained mercury. To a woman who had no mercury in the urine an injection of the bichloride was administered and five days after I found mercury in the urine of her child. In another case mercury was found in the urine of a child each time after six experiments with bichloride injections given to its mother. These facts are in accord with the results of many other investigators, and they seem to prove conclusively that mercury may be conveyed to the child by its mercurialized mother's milk." The evidence obtained through chemical analysis by many competent observers is in striking accord with the results of clinical observation, and the combined knowledge I think proves the benefit—never, however, absolute—of the mercurialized milk of a syphilitic mother.

In all probability other conditions besides the mercury contained in the milk are involved in the child's improvement. Undoubtedly, the syphilitic woman's health and nutrition are improved by the systematic inunction treatment which she receives, and as a consequence her milk is purer and more sustaining to the child than it would be without the treatment. She then gives a more competent milk, and dissolved in it is the remedy which the infant so sorely needs.

The practical deduction to be drawn from these facts, accumulated during a period of several hundred years, is that we should treat the syphilitic mother whenever we can, particularly by inunctions, not only for her own sake, but also for that of her child, for it benefits the one that receives and the one that gives.

We must not forget that in many cases syphilis is transmitted

[1] "Untersuchungen über des Nachweis der Quecksilber in der Frauenmilch während einer Einreibungscur mit grauer Salbe," *Vierteljahr. für Derm. und Syphilis*, 1876, p. 207, *et seq.*

[2] *Op. cit.*, p. 415.

directly from an infected father to his offspring, and that the mother remains to all appearances free from the disease. The question, therefore, arises, What shall we do in the event of a non-syphilitic woman having a syphilitic child by paternal transmission? It will be found that some of these mothers are thin, sickly-looking women, while others are well-developed and robust. In these cases it has been my practice, when there was difficulty in administering mercurials to the child, to explain the condition of affairs to the mother, and with her consent (which is, as a rule, readily gained) to try a tentative course of treatment upon her. When inunctions cannot be used, hypodermic injections may be given or the mixed treatment may be taken. The question of utility and of benefit will be settled in a week or two.

We may conclude, therefore, that the indirect treatment of hereditary syphilis by mercury should not be regarded as one of the standard methods, but rather as a resource to fall back upon, or as an adjuvant to be instituted in cases in which it is admissible or seems to offer probabilities of benefit.

Indirect Administration of Iodide of Potassium to the Syphilitic Child by Means of the Milk of the Mother or Nurse.—Not only is mercury administered to the syphilitic child by means of the milk, but several authors have adopted this method of employing iodide of potassium as the therapeutic agent. La Bourdette and Dumesnil,[1] many years ago, showed by quantitative analysis the presence of iodine in the milk of animals to whom the iodide of potassium had been administered. This observation was later confirmed by Schafer,[2] who found iodine in the milk of a woman two hours after the ingestion of 15 grains of the iodide. These results were fully confirmed by a number of experimenters, among whom was Welander,[3] who observed an iodic coryza and iodic eruption in a nursing infant whose mother was taking fifteen grains of the iodide daily.

In clinical practice the indirect treatment with iodide of potassium does not possess a rich literature, but the reported results are certainly worthy of record and consideration. Lazansky[4] in Pick's clinic thus treated a four months' old child whose mother took 15 grains of the iodide daily. The eruption quickly left the child and the mother became healthier. Chemical analysis of the milk and of the infant's urine showed the presence of iodine. This observation is supported by

[1] "Du Passage de l'Iode par Assimilation digestive dans le Lait de quelques Mammifères," *Gazette des Hôpitaux*, 1856.

[2] "Aufsugung und Auscheidung der offic. Iodpraeparate," *Zeitschrift der Wiener Aertze*, 1859, No. 5.

[3] *Nordiskt Mediciniskt Archiv.* t. vi., v. 31, 1874.

[4] "Ueber die therapeutische Verwendung von iodhältiger Ammenmilch," *Vierteljahr. für Derm. und Syphilis*, 1878, p. 43, *et seq.*

the results obtained by Link,[1] who thus treated four cases in Ganghofer's clinic in Prague. In the first case, a child ten weeks old, having snuffles, general exanthem, and ulcers, was promptly benefited and cured of its visible lesions in thirty-three days. In the second case, a four-months' old girl, with exanthematic symptoms, and bad diarrhœa, was relieved of her existing lesions in five weeks. The third case was that of a premature girl, who two days after birth had a general exanthematic condition. During the ensuing fourteen days, in which the mother took 30 grains of the iodide daily, the child increased in weight, and its rash slowly vanished. In the fourth case, a child at nine weeks presented active symptoms of hereditary syphilis. For two weeks it was treated non-specifically and then it was subjected to the indirect treatment. At the end of five weeks its health and weight were improved and its rash had disappeared. Link thinks these results very gratifying, for the reason that the disease was active in the infants, and was accompanied with such complications as diarrhœa and stomatitis.

It is claimed by Stumpf[2] and others, on theoretical grounds, that the use of iodide of potassium in such cases is contraindicated, for the reason that it tends to diminish the quantity of the milk and to induce atrophy of the mammary glands. It is very probable that a prolonged course of the iodide will produce the effects claimed to result from this drug, but such will rarely be necessary in practice. This treatment, if it is adopted by any one, need not of necessity be very long continued, but its effects on mother and child should be carefully watched. If beneficial it may be used until the child is far enough along to do without treatment for some time or until it can bear direct treatment. Contraindicating conditions should cause its prompt rejection.

The indirect treatment of hereditary syphilis by means of the iodide is therefore a measure of reserve and utility, to be employed only in some cases when other methods are impracticable or temporarily contraindicated.

As in the section on the General Methodical Treatment of Syphilis I take the ground that in most cases iodide of potassium is powerless, and often harmful, it may seem inconsistent for me thus in a measure to recommend this drug for women and children. But it is well to remember that in some cases there seem to be two conditions to treat—namely, the essential syphilis and the symptoms—which are explainable only on the theory advanced by Finger,[3] that in addition to the syphilitic virus the system is poisoned by ptomaïnes or

[1] "Ueber die Behandlung der Syphilis bei Säuglingen," *Prager med. Wochenschrift*, 1883, p. 305, *et seq.*

[2] "Ueber die Veränderungen der Milchsecretion unter dem Einflusse eineger Medicamente," *Deutsches Archiv für klin. Med.*, vol. xxx., 1881 and 1882, p. 201, *et seq.*

[3] "Die Syphilis als Infectionskrankheit vom Stand-Punkte der modernen Bacteriologie," *Archiv. für Derm. und Syphilis*, 1890, pp. 340, 341.

tissue-products which result from the action of the virus. Besides the symptoms already mentioned as being probably caused by tissue-products, it seems very probable, judging from clinical observation, that in pregnant syphilitic women and their children these morbid secretions are very often active and potent. At any rate, the theory seems rational, and it is an undisputed fact that in some of these cases the iodide acts favorably.

It is also necessary to emphasize the fact that the mixed treatment, either with an excess of the iodide or of mercury, is, as said before, very often a most valuable agent in the treatment of pregnant syphilitic women. Useful and efficacious before childbirth, it is also in some cases beneficial to the mother and also to the child. The indirect method, employing the mixed treatment, should be remembered by physicians in the category of inunctions and of iodide of potassium.

The Treatment of the Syphilitic Infant.—The treatment of the syphilitic infant is in many cases a question which necessitates great delicacy, tact, and prudence on the part of the physician, and in every case a good knowledge of the disease, of medicine in general, and of therapeutics is required. The subject can best be presented by a consideration of the condition of the infant from its birth onward. The first question to settle is when to begin to treat the child. So eminent an authority as Archambault[1] thinks that the offspring of a known syphilitic father or mother should be put upon treatment at once, even if it appears healthy and presents no visible syphilitic lesions. Should such a child present any evidence of cachexia, the prompt adoption of treatment is imperative. However, as it is not very uncommon for a syphilitic woman to beget, or a syphilitic father to procreate, a seemingly healthy child, which as it grows up may show no evidence of hereditary infection, it is always well, if medication is commenced very early, that it should not be too active or energetic. A baby may be puny at birth and not be syphilitic, but it is fair to assume that a puny baby whose father or mother is syphilitic is so far syphilitic itself that it needs the intervention of rational treatment.

It may be stated as a general rule that syphilitic infants who have a chance, even slender, for their life come into the world with little or no sign of their inheritance upon them. Therefore for a time important objective phenomena are wanting. Then in many cases the physician can get no information, for the reason that the parents may forget that they have had syphilis or they (one or both) conceal the fact, or, again, they may be ignorant of the possibility and danger of hereditary transmission. In hospitals we frequently see women who give birth to

[1] "Traitement de la Syphilis infantile," *Journal de Médecine et Chirurgie pratiques*, June, 1878.

tainted children, but who can give no facts relating to the father from whom the disease had been derived. Then in infant and foundling asylums children in the very early latent period of syphilis are left for care, concerning whom no history whatever is obtainable. So that in private and in public practice the diagnosis of hereditary syphilis in the new-born is commonly very difficult, and ready knowledge and acumen on the part of the physician are very essential.

In private practice, in many cases where no data are volunteered by either father or mother as to their condition before the birth of the infant or as to the probable cause of or source of its disease, the physician's position is very delicate, and sometimes very trying. Under these circumstances, he should act with great prudence and tact, keeping his own counsel, but he should at once place the child upon proper treatment, and then await developments. Generally, the child's illness will cause the father or the mother to think of his or her previous condition, and then a ray of light may be shed. As a general rule, in this complication of affairs the physician had better, if necessary, approach the father on the subject of the child's disease, since he commonly will be found to be the guilty person, or his past history will be such that a suspicion of syphilis derived from him will not greatly shock or surprise him. In general, he will do very little in the way of recrimination of his wife, and will prefer to keep silent.

Before considering general methodical treatment, something should be said concerning the management of young infants and children thus infected. First, as to the nourishment. If possible, the child should be nursed by its mother, who should be subjected to proper treatment, and placed in such a condition that she can supply nutritious milk. If the mother cannot suckle her child, it must be put upon cow's milk properly sterilized, and care must be taken to sustain its nutrition in every possible way. In no instance should a syphilitic child be put to the breast of a healthy woman. Though Diday has long advised and sanctioned such a course, the condemnation of it by all other authors is unanimous. On this subject I can with advantage quote the words of Grassi[1] on the responsibility of the physician concerning the employment of a wet-nurse for a syphilitic child. He says: "It is the peremptory duty of the parents to inform the wet-nurse of the danger she is exposing herself to. This is especially the duty of the physician, as there are cases on record in which such wet-nurses have infected their husbands, their children, and other persons in their neighborhood. But even if a wet-nurse knowingly contracted for such service in consideration of large pay, it would be the duty of the physician to prevent

[1] "Un Appunto all' Articolo di Diday: Sulla Responsibilita del Medico verso il neonato e verso la Nutrice," *Giornale Italiano delle Malattie Ven. e delle Pelle*, vol. ii., 1868, p. 233, *et seq.*

this, for individual liberty must be restricted as soon as others suffer from it: *Salus publica suprema lex esto.*" Fournier has also spoken emphatically in the same vein. If possible, a well-nourished syphilitic wet-nurse should be obtained. This is usually a less difficult task than might be supposed, for syphilitic mothers can usually be found in infant asylums and in large public hospitals. In some rare cases, for various reasons, the urgency is very great, and parents are willing to make any sacrifice to save their child. On this subject Steiner[1] says "that a syphilitic child should not be given to a wet-nurse. I must, however, confess that there are exceptions to the rule. I myself have been obliged to allow this in certain cases where life could only be preserved by the employment of a wet-nurse. *But I never do this without informing the nurse of the danger she is likely to expose herself to.* If, thus warned, she is prepared to undergo the risk, I have at least done my duty as a man and as a physician." The foregoing so clearly brings out the necessities and duties in these cases that nothing remains to be added.

On the Continent the practice of suckling syphilitic children by means of a she-goat or she-ass has been in vogue from an early date, but it has not, to my knowledge, been employed in this country. In a recent brochure Bellaserra[2] strongly advocates the use of animals in nursing syphilitic infants, and he makes the suggestion that she-goats and she-asses should be kept ready for such use at maternity hospitals and at infant asylums. If this method is adopted in any case, due care must be taken that the quantity and quality of the milk shall be in keeping with that of the human female.

The general hygiene of the child should be upon as high a plane as possible. Hereditary syphilis, being accompanied with atrophy, wasting, and many debilitating influences, requires more than any other infantile disease every possible healthy surrounding and aid. Then stress should be laid upon the actual care of the infant. The physician should endeavor to bring intelligent antisepsis to its aid in every possible direction. The mouth, tongue, and nose should receive attention, and for this purpose there is nothing better than a solution of boric acid (10 to 20 grains to the ounce). With this the nose, if snuffles are present, may be gently irrigated, and the mouth carefully washed three or four times a day. Great care should be exercised to prevent septic infection. The tissues of the young child, particularly when it is syphilitic, are very vulnerable to the inroads of pyogenic and septic cocci, which luxuriate in them. These gain access to

[1] "Zur Behandlung der Hereditären Syphilis," *Oesterr Jahrbuch für Pädiatrik*, 1870, N. F. 1, p. 95, *et seq.*

[2] "Prophylaxia de la Sifilis en el Niño y en la nodeyza por Medio de la lactencia Animal, particularmente en las Matermidades y Casas de expósitos," *Revista de Ciencias Medicas de Barcelona*, 1887, 5, p. 129, *et seq.*

the system through the skin and mucous membrane, also through the intestines, and probably through the lungs. Therefore, great care should be taken to heal up quickly any fissure, abrasion, or cut surface. Thus any lesion about the scalp, face, mouth, eyes, and anus or on any part of the body should be looked upon as a source of danger, and promptly healed. In very early days the navel should be carefully watched and kept in an aseptic condition by irrigations of carbolic-acid water, followed by drying and dusting with powdered boric acid or some other absorbent powder. Then further, the anus and its folds should be looked after. Attention to the alimentary canal may perhaps restore that to a satisfactory condition, and thus rid the child of a serious source of danger.

As before stated, in most cases of hereditary syphilis in which the child is born alive there may be no evidence of its disease at birth or for some time after. But in some cases soon after birth syphilitic lesions are seen in the infant. The most precocious evidence of hereditary syphilis is the bullous eruption, and it is always the expression of profound systemic poisoning. I may briefly state that this syphilide occurs most commonly and most typically upon the palms and soles as vesicles and bullæ which soon become purulent. They may appear about the buttocks, along the folds of the groin, or about the face and neck. There is usually a concomitant cachexia, or even marasmus, and the general skin is of a dull red, even violaceous, hue. In many cases snuffles and excoriations in the mouth are also present, and perhaps other evidences of syphilis. It is well to warn young practitioners that there is a simple form of pemphigus of the very young infant, and that great care in diagnosis is necessary. While, in general, infants presenting syphilitic pemphigus die within a few days, in some instances they may live. I have seen two such cases, and Neumann speaks of seeing one. This eruption brings up the question of the very earliest treatment of hereditary syphilis. For very young infants, as a rule, some mercurial salt in powder form, internally administered, is the one best borne and most commonly productive of good, if such is attainable. For this purpose many prefer calomel, and they administer it in doses of $\frac{1}{8}$ to $\frac{1}{3}$ grain three times daily for very young children. It is well to give a small dose to a very weakly child, and then to increase it as fast as possible. For well-nourished infants $\frac{1}{3}$ or $\frac{1}{2}$ grain may be given three times daily. Calomel can be rubbed up with a little sugar of milk, and the powder placed on the child's tongue before it is put to the breast. In case of diarrhœa, colic, or sleeplessness, a little Dover's powder may be added to the mercurial preparation which is to be used. When it is possible to administer them, adjuvant tonics should be combined with the mercurial. For this purpose the saccharated carbonate of iron is much praised by Stei-

ner and other authorities in children's diseases. It is palatable and well borne by the stomach, and may often be employed with marked benefit, particularly in children who have reached their third or fourth month. Many years ago Monti[1] proposed the saccharated iodide of iron in the treament of syphilis, either with or without the addition of calomel. It is a remedy which may be given with benefit when the child is six months or a year old, but considerable difficulty will be experienced in giving it to very young infants in whom it may also produce vomiting. Within a few years Monti[2] has proposed a combination of calomel and lactate of iron, which I have found of especial benefit in children three months and more old. The prescription is as follows:

℞. Hydrarg. chlor. mit., gr. iss;
Ferri lactatis, gr. v;
Sacchari albi, gr. xlv.—M.
Ft. in pulv. No. x.

From one to four of these powders may be given daily, according to the weight of the child.

Calomel may be given for a considerable time with benefit and without deranging the stomach and bowels. However, its action should be carefully watched, and if anæmia shows itself the calomel should be discontinued.

Following a course of calomel powders it is well to allow an interruption in the specific treatment, during which the saccharated carbonate of iron may be given or the saccharated iodide of iron, according to the formula of Monti, as follows:

℞. Ferri iodidi saccharat., gr. xv.
Sacchari albi, gr. xxx.—M.
Ft. pulv. No. x.

One to three powders should be given daily, according to circumstances.

Gray powder (hydrargyrum cum cretâ) is also used by many. It is sometimes quite efficient in its action, and commonly it is less liable to produce gastro-intestinal reaction than any other mercurial. Its use is indicated in very weak infants with a tendency to great disturbance of the stomach and bowels. It is, however, not uniformly efficacious. It may be given in doses from $\frac{1}{8}$ to $\frac{1}{3}$ of a grain three times daily.

The protoiodide of mercury has been used in the treatment of hereditary syphilis with more or less benefit for many years. Bednar[3] used

[1] "Ueber die Behandlung der Augebornen Lues mit Ferri iod. Saccharat," *Journal für Kinderheilkunde*, 1876, vol. ix. p. 335, *et seq.*

[2] "Ueber ältere und Neuere Methoden der Behandlung der Augebornen Lues," *Archiv für Kinderheilkunde*, vol. vi., 1885.

[3] *Die Krankheiten der Neugebornen und Säuglingen*, Wien, 1853.

it largely in $\frac{1}{8}$- to $\frac{1}{4}$-grain doses, and considered it very efficient. Later experience has shown that in general these doses are too large, and are apt to be followed by bowel troubles and anæmia. Monti thinks that this salt is especially beneficial in the bone lesions of hereditary syphilis, and uses the following formula:

℞. Hydrarg. iodidi virid., gr. iss;
Ferri lactatis, gr. iij;
Sacchari albi, gr. xlv.—M.
Ft. in pulv. No. x.
One to three powders may be given daily.

In very young children it is well, if the protoiodide is used, to begin with the dose of $\frac{1}{20}$ grain, which may be increased according to indications. Though it is an active and efficient remedy, its use is commonly attended with colic and intestinal derangements, which necessitate the admixture of powdered opium or Dover's powder.

Henoch prefers the black oxide of mercury, according to the following formula:

℞. Hydrarg. oxid. nigri, gr. iss;
Sacchari albi, gr. xlv.—M.
Ft. pulv. No. x.
One powder morning and evening.

Monti has found this preparation less efficient than calomel.

The tannate of mercury is well thought of by some authorities, and it will be found to be very prompt in its action, and to cause syphilitic lesions to disappear rapidly. It may be given in doses of $\frac{1}{20}$ to $\frac{1}{8}$ grain three times daily, according to the age and weight of the child.

I have recently seen a mild and efficient action follow the use of the thymolate of mercury in two cases of hereditary syphilis, and I think that this preparation, as made by Merck & Co., should be borne in mind, for it is capable of producing good results.

In administering these mercurial powders the physician should always be on the watch as to their action and as to the condition of the little patient. In general, interrupted courses of a month or six weeks' duration should be followed, during which the child should have plenty of fresh air and every conceivable hygienic benefit.

By many authors corrosive sublimate is held in high esteem in the treatment of hereditary syphilis. It is used chiefly in the very early weeks of life and throughout the child's first year. If used, it is best given in Van Swieten's liquid in combination with a little milk. For very young children the dose of Van Sweiten's liquid is 5

to 10 drops two or three times a day, which is to be increased considerably for older children.

Thiry of Brussels recommends a solution of corrosive sublimate in emulsion of bitter almonds as preferable to any other preparation. There can be no doubt that some benefit may result from this mercurial salt when taken by the mouth in some cases, but in my judgment it is far inferior to the salts already mentioned, and cannot be compared for certainty of effect with inunctions. In whatever form given, corrosive sublimate is exceedingly liable to derange the stomach and bowels; hence it is at best a very uncertain remedy. Given subcutaneously, it is frequently very efficient. It may be well to remark that most of the authors who recommend this agent by the mouth add as a rider to their remarks that it may be necessary also to employ inunctions simultaneously, or give the child in addition baths of corrosive sublimate.

Iodide of potassium has a limited sphere in the treatment of hereditary syphilis. It may be of benefit in bone, joint, and cerebral affections and in lesions of the eye and ear. On this subject Steiner,[1] who made comparative studies of the treatment of syphilis by mercury, by iodine, and by the expectant plan, says: "From my experiments on children I am convinced that iodine, as well as mercury, causes the symptoms of hereditary syphilis to disappear, yet with the important difference that this happens more slowly under the administration of iodine than of mercury. Whatever improvement is attained in days with mercury is not accomplished in weeks with iodine."

As already stated, the limits of employment of the iodide are restricted, and its use in children as in adults is attended by more or less severe symptoms of iodism. In some children small doses produce prompt toxic effects, while in others saturation of the system may occur before untoward symptoms show themselves. The main symptoms of iodic derangement in children are—gastric and gastro-intestinal irritations, catarrh of the nasal mucous membrane, angina, headache, trembling, increased temperature, emaciation and weakness, and sometimes dermatitis of varying severity. These possible complications should be remembered by the physician. It should be mentioned that some physicians who recommend the iodide also state that it is well to combine its administration with inunction. Monti makes the significant remark that the iodide is only suitable for cases in which an energetic treatment is not indicated, or where sublimate baths are used.

The dose of the iodide for very young infants is from $\frac{1}{2}$ to 1 grain, well diluted, three times a day. For children of a year and older, 5 grains or more may be given three times daily.

The mixed treatment, however, is very efficient in many cases of hereditary syphilis, particularly of the bones and viscera, and in syphi-

[1] *Op. cit.*

litic subcutaneous tumors. My experience with the following formula, which I gave in my book[1] years ago, has been uniformly favorable in the cases in which a combination treatment is indicated:

℞. Hydrarg. chloridi corrosiv.,		gr. j–ij;
Potassii iodidi,		ʒss;
Syrup. aurantii cort.,		
Aquæ,	āā.	ʒij.—M.

For young children the dose is 5 to 10 drops (always well diluted) three times a day. This preparation is practically the same as Gibert's syrup, which is much employed by French physicians.

In addition to this treatment by the mouth, other methods of using mercury are employed in the treatment of hereditary syphilis. As a general rule, mercury by stomach ingestion is to be recommended for the first year of the child's life. As it grows older we can resort to mercurial inunctions. This method of treatment is as efficient for the infant and child as for the adult, and its administration to the former requires all the care and circumspection laid down as necessary for the latter. (See section on Inunctions.) There is a marked lack of unanimity of opinion in the minds of medical men as to the value and usefulness of inunctions in hereditary syphilis. Thus we find their use strongly deprecated by Widerhofer,[2] who says that they produce bad results, and that he has seen fatal bleeding from the ears and marasmus produced by them, while, on the other hand, Simon[3] and many others speak warmly in their praise. The truth is, that much benefit may be derived from their use, provided due caution and care are exercised. The inunctions should be given daily, using 15 or 20 grains of the strong mercurial ointment, going over the whole body after the plan already described. (See p. 86.) At the same time, the child should receive an iron tonic, and perhaps some cod-liver oil. Should signs of debility, restlessness, and sleeplessness, of weakness or anæmia, show themselves, the inunctions should be stopped at once. In some cases, particularly in children a year or more old, the local use of mercurial ointment or of mercurial plasters is productive of much benefit. The ointment may be spread upon canton flannel or buckskin, and bound around the child's body. By this means mercury is absorbed, and frequently benefit is noted, particularly in cases of enlarged liver or spleen. Mercurial inunctions and plasters are very effective in many cases of

[1] *Syphilitic Lesions of the Osseous System in Infants and Young Children*, New York, 1876.

[2] "Ueber Syphilis und deren Behandlung," *Allg. Wien. med. Zeitung*, 1886, Nos. 30 and 31.

[3] "De la Syphilis infantile congenitale: de sou Traitement comparé avec celui de la Syphilis des Adultes," *Rev. mens. des Maladies de l'Enfance*, June, 1886, p. 245, *et seq.*

hereditary bone and joint disease. In intracranial syphilis, meningeal inflammation, gummy tumors, and hydrocephalus internus, this method, particularly when combined with iodide of potassium given internally, is often productive of surprising results. The quantity of mercurial ointment (50 per cent.) for each inunction is about 15 grains for a young child, and this quantity may be increased to 30 grains, provided there are no contraindicating conditions, and that improvement is noted. Elsenberg in a recent essay [1] advises full doses of the iodide internally, and the inunctions to be pushed until slight gingivitis or salivation is produced; then the dose should be diminished or the treatment temporarily stopped. It may be necessary and expedient thus to push this combination treatment, but it should only be done when the case is under the careful observation of the physician.

Widerhofer prefers an ointment of red precipitate (1 : 100 of lanolin) to mercurial ointment for children. About the head a white precipitate ointment (1 drachm to 1 ounce of vaseline) will be found of decided benefit, and in the case of infants with very fastidious parents this ointment may take the place of the blue ointment. White precipitate is readily absorbed by the adult or infant integument.

Hypodermic injections of mercurial preparations have long been used in the treatment of hereditary syphilis. Monti [2] was one of the first experimenters with this method, and he employed it in cases of intestinal troubles, of laryngitis, and where a quick result was necessary. His doses of the sublimate thus used were from $\frac{1}{32}$ to $\frac{1}{8}$ of a grain. In children under a year old the smallest dose is used; in those under five years of age $\frac{1}{24}$ of a grain; and in large, well-developed children $\frac{1}{16}$ of a grain may be injected. My colleague, Professor Jacobi, informs me that he has used these injections in very young infants and in older ones for many years in severe cases when a prompt and efficient action was necessary. He has seen benefit in very bad cases in children recently born. The resulting nodosities are said not to be painful, to cause little if any inconvenience, and to disappear promptly. I can well understand that in some private and hospital cases this method may be employed with signal success when the child is fully under the control of the physician. But it should always be employed with care and watchfulness. Monti, Smirnoff, and others advocate the use of calomel injections, while others, again, employ the albuminate, the peptonate, and other preparations of mercury. No preparation of mercury, however, is superior to the sublimate for this purpose.

This treatment will never, to my mind, be a success in dispensaries

[1] "Die Behandlung der Syphilis," *Wiener Klinik*, Aug. and Sept., 1891, p. 277, *et seq.*

[2] "Beobachtungen über die Behandlung der Syphilis congenita et acquisita mittelst subcutanen sublimat Injectionen," *Jahrb. für Kinderheilkunde*, 1869, 4 Heft.

and clinics. Moncorvo and Ferreira[1] in an out-door clinic of Rio Janeiro used gray oil, calomel, salicylate of mercury, and yellow oxide on forty-seven children from thirty-eight days to fourteen years old, taking the retro-trochanteric regions for the sites of injection. They found that the sublimate and gray oil were easily borne and most efficient. But we find at the end of nearly every clinical history these significant words: "Le malade ne revient plus au service," "nous avous perdu de vue cette fillete." In my experience in out-door services, as a rule, after hypodermic injections of mercurials patients submit to one or two, and perhaps more, and then they disappear.

Baths of corrosive sublimate are frequently of great benefit in the treatment of hereditary syphilis, and it is important that the physician should know their scope and their limitations. They should never be relied upon as a methodical treatment, though Cassel[2] claims that by the use of from twelve to thirty-six baths he has cured obstinate cases of bone-lesions, sometimes with the aid of calomel. These baths are particularly indicated in the cases of the bullous syphilide, of syphilitic roseola, of papular syphilides, condylomata about the genitals, and in cases in which there are complicating ulcerations. In some children with a thin, atrophic skin, icterus, and enlarged spleen they may produce benefit. The quantity, as stated by Elsenberg,[3] will be found to be beneficial. Thus $7\frac{1}{2}$ to 30 grains of sublimate, according to the age and size of the child, with an equal quantity of chloride of ammonium, dissolved in a glass of hot water, should be added to 7 or 8 gallons of warm water. The child should stay in this from five to ten minutes, and then should be wrapped up warmly and put to bed. If erythema follows this treatment, the surface should be dusted with infant powder. But if the reaction is severe and persistent, it may be necessary to discontinue the baths. The suitability of the treatment may be ascertained after three or four baths. If the general condition of the child and its lesions are benefited, they may be kept up. But any signs of resulting depression, weakness, sleeplessness, and refusal of food should lead to their discontinuance. The baths may be given every second day, or perhaps every third or fourth day. Though some authors recommend this method of treatment for very young infants, as a rule it will be found of most service in children from one to three years old. Iodide-of-potassium baths have been used, but no one has claimed to have obtained conspicuously brilliant results.

[1] "Du Traitement de la Syphilis infantile par les Injections souscutanées de Sels mercurielles," *Revue mensuelle des Mal. de l'Enfance*, June and July, 1891.

[2] "Beiträge zur Hereditären Syphilis, besonders du Knockenerkrankungen bei desselben, *Archiv für Kinderheilkunde*, 1885, Bd. 6 p. 17, *et seq.*

[3] *Op. cit.*, pp. 244, 277.

Local applications to the lesions of hereditary syphilis are similar to those used in the acquired form of the disease. The ulcers and encrusted surfaces left by the bullous syphilide and other eruptions of an ulcerative character should first be washed with a 1 or 2 per cent. carbolic solution, and then dressed with the following:

℞. Zinci oxidi,
Pulv. amyli, āā ʒij;
Hydrarg. chloridi mite, ʒss–ʒj;
Vaselini, ℥ss.—M.

This ointment may be used for fissures about the mouth, nose, and anus. If a stimulant is admissible, 10 drops of carbolic acid may be added to each ounce of ointment.

White precipitate ointment and a combination of protoiodide of mercury and cold cream (10 to 20 grains to the ounce) may be useful in scaling papular eruptions, particularly of the palms and soles.

Rhinitis may be treated by the use of dilute Dobell's solution, injected slowly and carefully into the nostrils once or twice a day. This may be followed by the similar application of a solution of nitrate of silver (½ to 1 grain to the ounce of water). In some cases a mild solution of boric acid or of borax is beneficial in removing mucus and crusts. Mild solutions of nitrate of silver are necessary for mouth and lingual ulcerations. Condylomata lata of the genitals should be kept clean and dry, and should be dusted with a powder like the following:

℞. Hydrarg. chloridi mite, ʒiss;
Pulv. amyli, ℥j.—M.

If these lesions have become hypertrophic, they may be carefully touched with a solution of nitrate of silver (10 grains to the ounce), or with the ordinary acetic acid, or half-strength carbolic acid. When stimulating applications are made to these lesions, great care should be taken to prevent inflammatory reaction.

Bone, joint, and fascial lesions should be treated by plasters formed of strong mercurial ointment and Lassar's paste, of each equal quantities. In the management of hereditary ocular and aural affections, besides an energetic internal treatment, such local measures are necessary as may be indicated by the condition present.

In general, the treatment of acquired syphilis in infants and young children is the same as that given for the hereditary form of the disease. In acquired syphilis of the young the physician has less trouble, for he usually does not have the atrophic condition and the tendency to marasmus which are so common in the hereditary disease.

SCARLET FEVER, MEASLES, RÖTHELN, AND VARICELLA.

By J. LEWIS SMITH, M. D.

SCARLET FEVER.

Prophylaxis.

In order to determine how to prevent a disease the nature and mode of operation of its cause should be ascertained. This is especially true as regards the infectious maladies. The microbe which causes scarlet fever has not been positively ascertained, but the mode in which it is propagated has become known to a certain extent by clinical observation. Scarlet fever is contagious from the first day of its occurrence, and, if no disinfection be employed, its contagiousness probably does not cease as long as desquamation continues. The discharge from the ear following scarlet fever, due to otitis media, is believed by some to be infectious, even after the desquamative period is over, unless the ear be treated by antiseptic injections. If this be so, the contagiousness of scarlet fever is prolonged beyond that of most other infectious maladies.

The area of contagiousness of this disease is small, extending only a few feet from the patient. Hence in the asylums its spread is more certainly prevented by strict isolation of patients than is measles or pertussis, the specific principles of which are more diffusible in the atmosphere, and their area of contagiousness therefore considerably greater. The fixity or feeble diffusibility of the scarlatinous poison affords explanation of the fact that many children who are exposed, particularly if remotely exposed, do not contract the disease. Dr. Billington has stated that of 90 children in 26 families who were exposed to scarlet fever, 43 contracted it, while the remaining 47 escaped; whereas, as is well known, few children unprotected by a previous attack fail to contract pertussis, variola, varicella, or measles if exposed to either of these diseases. In the New York Foundling Asylum, during a series of years, children with scarlet fever were quarantined in a small room attached to one of the wards. The door between this room and the ward was permanently closed and the nurses of the scarlet-fever patients were strictly isolated. By these simple precautionary measures an outbreak of scarlet fever in this

institution was usually limited to a few cases, whereas the same precautionary measures employed in regard to measles and pertussis were ineffectual in preventing the spread of these diseases, which required isolation to a greater distance.

But this advantage in the small area of contagiousness of scarlet fever is more than counterbalanced by the remarkable tenacity with which the scarlatinous poison adheres to persons and objects, and its consequent portability from one locality to another. In its tenacious attachment to objects and its portability the scarlatinous virus surpasses that of any other eruptive fever except small-pox. I have never met a case in which there was even the suspicion that measles or pertussis was communicated by a third person or by an infected article, but scarlet fever is often communicated in this manner. In one instance that came under my notice a washerwoman, whose child had scarlet fever, communicated the disease to the infant in the household where she was employed by placing her shawl over the cradle in which it was lying.

In the New York *Medical Record*, August 4, 1888, the case of a servant-girl is related who nursed a child with scarlet fever in a distant city. She then packed in a trunk her effects, including the dress which she had worn when nursing the patient. The trunk brought from the distant city was opened one year subsequently in the presence of a girl of eight years, who handled the articles. This girl was soon afterward attacked with scarlet fever, and, as she had not been away from home and as there was no other case in the vicinity, there could be no reasonable doubt that the contents of the trunk, undisturbed for a year, had communicated the disease. A physician of my acquaintance called upon a family, stated that he had just come from a case of scarlet fever, and took one of the children upon his lap. This child soon came down with a fatal form of the disease, and the two remaining children also contracted it, one of them dying. In New York City, cases which I have observed render it highly probable that scarlet fever is often communicated through schoolbooks, which, illustrated by pictures and rendered attractive to the young, often lie on the bed of the scarlatinous patient, and are handled by him during his convalescence, or even during the disease if it be mild. The young librarian of the circulating library of a Sunday-school whose pupils came largely from the tenement-houses, spent one day in covering and arranging the books. After about the usual incubative period of scarlet fever he sickened with the disease. His two sisters were immediately removed to an inland town three hundred miles away, and to an isolated house where scarlet fever had never occurred. About one month after his recovery, the room which he occupied having been disinfected by burning sulphur, the bed-clothes and linen washed in boiling water, and all articles suspected of holding the poison either disinfected or destroyed, the

brother visited his sisters in the country. Soon after one of them sickened with scarlet fever, and a little later the other also. Two months elapsed after the last case, the room occupied in the country-house had been fumigated by burning sulphur from morning until evening, and the family had returned to New York, when a little girl from an inland city remained a few days in the house. She also soon after sickened with scarlet fever, which was fatal.

Similar cases might be related, showing that the scarlatinous poison adheres tenaciously to objects for many months, so as to produce the disease in those who are so unfortunate as to be exposed. The judicious regulations enforced by health boards have certainly had an effect in diminishing the prevalence of all contagious diseases, but cases such as I have detailed show the urgent need of additional prophylactic measures as regards scarlet fever; and the same is true of diphtheria.

It is the common practice, after the termination of a contagious disease, to disinfect the apartment vacated by the patient by burning sulphur, with the windows and doors closed. Is this the best that can be done? It is certain that it often fails to produce the desired effect. I have elsewhere stated that in the winter of 1887–88 diphtheria prevailed in the New York Infant Asylum, and that a ward in which five cases had occurred was vacated, its doors, windows, and crevices closed, and sulphur, 40 pounds, or 2 pounds to 100 cubic feet of air, was burnt in the ward. After seven hours the doors and windows were opened, and Drs. Prudden and Cheeseman immediately raised a dust from the floor and bedding and allowed it to settle in culture-media. All other sources of infection were excluded from the media. The culture produced so large a number of microbes that they overlay each other, but the observers were able to distinguish the *Streptococcus pyogenes* in the media, identical in form and appearance with the streptococcus which they had previously discovered in an umbilical phlegmon which one of the diphtheritic infants had in addition to the faucial diphtheria. Although more sulphur was employed than is recommended by the New York Health Board, it was inadequate to destroy the microbes.

Dr. Squibb, who is justly regarded as a high authority in matters pertaining to domiciliary disinfection, and to whom the above facts were communicated, replied that, in his opinion, the lack of success from the employment of the sulphur vapor as a disinfectant is due in part to the fact that it is used in too dry a state. If the sulphur be burnt over a wet sand-bath or in a room with boiling water, he believes that its germicidal power is greatly increased. Professor Prudden, witnessing the feeble germicidal action of burning sulphur, likens it to the burning of incense before the image of an offended deity, and says that it is scarcely more efficacious. Perhaps chlorine

is a more efficient germicide, evolved by adding sulphuric acid to a mixture of salt and black oxide of manganese, as employed by Professor Doremus in the Bellevue Hospital wards.

But attempts to prevent the spread of scarlet fever, as well as of diphtheria, by disinfection of the vacated room after the termination of the case, can only be partially successful if efficient preventive measures be not also employed during the continuance of the case, so as to prevent the formation of the poison or destroy it as soon as it is formed.

According to my observations, efficient prophylaxis requires the constant employment of disinfectants in the sick-room or upon the patient from the beginning of the disease or from the first visit of the physician.

Twenty-one years ago Dr. William Budd of Bristol, England, wrote of scarlet fever: "Time after time I have treated this fever in houses crowded from attic to basement with children and others, who have nevertheless escaped infection. The two elements in the method are separation on the one hand, and disinfection on the other."

I am not aware that Dr. Budd stated in detail his method of isolation and disinfection. The New York Health Board very properly gives directions that all objects not required to promote the comfort of the patient shall be removed from the sick-room; its floor and walls should be bare, and no one be allowed to enter it except the physician, nurse, and near relatives. For reasons already stated, books and other reading matter should not be allowed in the hands, upon the bed, or in the room occupied by a scarlatinous patient unless positive directions be given that they be subsequently burnt.

The attempt to prevent the spread of scarlet fever and the other infectious diseases by administering internally antiseptics and disinfectants to those who are exposed has, I believe, thus far met with little encouragement. It is a question whether the efficient antiseptics employed internally can, on account of their toxic properties, be safely used in doses sufficiently large to counteract the specific principle of scarlet fever when it has obtained lodgment in the system, so as to prevent the disease. Certainly, in the present state of our knowledge, the most efficient and reliable prophylactic measures consist in strict isolation of the patient, the disinfection of his person, disinfection of the air which surrounds him, and of objects and persons that are in close relation with him. It is quite possible, I think, by the employment of such measures, to realize the experience of Dr. Budd. I recommend for disinfection of the room at my first visit, to be used almost continuously during the progress of the case, the following prescription:

℞. Acidi carbolici,
Olei eucalypti, āā. ℥j;
Spts. terebinth., ℥vj.—M.

Two table-spoonfuls are added to one quart of water in a tin wash-basin or similar vessel with broad surface, and maintained in a state of constant simmering over a gas or oil stove. The odor of this vapor is agreeable rather than unpleasant, and it appears to disinfect, to a considerable extent, the breath and exhalations from the body of the patient. At the same time, inunction is prescribed of the entire surface every three hours with the following:

℞. Acidi carbolici,
Olei eucalypti, āā. ʒj;
Olei olivæ, ʒvij.—M.

Pharyngitis, varying in severity according to the type of scarlet fever, is present in all cases. In not a few instances in New York City, where diphtheria prevails, either a diphtheritic exudate occurs upon the faucial surface, or the intensity of the scarlatinal inflammation produces a superficial necrosis, forming an eschar which is with difficulty distinguished from a diphtheritic patch. The breath exhaled over this surface is offensive, highly infectious if no disinfectant be used, and is no doubt the vehicle in numberless instances by which the disease is communicated. Therefore, the frequent application to the faucial surface of an antiseptic lotion or spray is strongly indicated, not only for its beneficial effect on the patient, as we will see hereafter, but as a means of diminishing the contagiousness of the disease. We will hereafter recommend as a disinfectant 1 part of peroxide of hydrogen to 3 parts of water, or 2 grains of corrosive sublimate to 1 pint of water, used as a gargle, or as a spray from a hard-rubber atomizer.

A sponge is too rough and irritating for the application of these or any other solution to the inflamed fauces. A large camel's-hair pencil, or surgeon's lint or absorbent cotton wound around a slender stick, may be used in the same manner in which Oatman and others employ it in the treatment of diphtheria, the application being made not only over the tonsils, but over the surface of the pharynx, behind and below the tonsils. Of course it is the anginose form of scarlet fever that more particularly requires this mode of treatment, and solutions of corrosive sublimate should be used cautiously, so that a toxic amount of it does not enter the system.

Antiseptic measures thus employed certainly greatly diminish the contagiousness of scarlet fever, but it is so very contagious that additional precautions should be taken. Constant ventilation of the sick-room should be maintained, whatever the weather, during the active period of the fever. This can be accomplished by a window partly open, a draft upon the patient being prevented by a screen, the temperature in the room being maintained at about 70° F., if necessary, by

a fire. No letter or written message or article of apparel or furniture should be sent from the room to any family during the continuance of the fever, nor afterward until proper disinfection be employed and sufficient time has elapsed. The cautious physician in attending scarlet fever will always bear in mind the possibility that his person or clothing may become infected, and be the vehicle by which the poison may be communicated to others. In examining the fauces of a patient he should stand a little to one side, so that no muco-pus, if the patient cough, be received upon his clothing, and he will not go directly from a scarlatinous patient to a child with another sickness or to a midwifery case without first washing his hands, hair, and face in an antiseptic solution and changing his outer apparel, or, if he be hastily summoned to a case without the opportunity of proper personal disinfection, he will approach no nearer the patient than is sufficient for a clear diagnosis.

Do health boards accomplish all that they are able to do in suppressing scarlet fever, as well as other contagious diseases? The exclusion from the schools of children living in houses in which the contagious diseases are occurring, the directions given for the disinfection of the bedding, clothes, and articles employed in the sick-room, and the promise to disinfect the sick-room when word is sent to the board, show a praiseworthy endeavor to eradicate diphtheria and scarlet fever as small-pox has been eradicated. But these measures are only partially successful. Many families in hired apartments never send word that they are ready for disinfection, and many in the cities move away as soon as the sickness is terminated in the belief that they can find more salubrious apartments elsewhere. The vacated rooms are rerented as soon as possible to families who have no knowledge of the previous sickness, and are surprised when their children immediately afterward are taken sick. Although the measures employed by health boards for domiciliary disinfection are often inadequate, it is the duty of attending physicians to see that they are carried out, such as they are, and to direct the employment of such other remedies as may seem necessary in order to prevent propagation of the disease.

The rubbing of the walls of the infected apartment with slices of fresh bread, which gathers up microbes, as recommended by distinguished authorities in bacteriology, and especially whitewashing or calcimining, or washing of the ceiling, walls, and floor with a solution of corrosive sublimate, should be insisted on before the apartment is again occupied.

Treatment.

Hygienic Measures.—The room occupied by a scarlatinous patient should be commodious and sufficiently ventilated. Its temperature

should be from 66° to 68° during the course of the fever. When the fever begins to abate and desquamation commences, the temperature of the sick-room should be a little higher, about 70° to 73°. In an equable and moderately warm temperature there is less danger of taking cold, and probably less danger of the occurrence of inflammatory complications, than in a cool and changeable temperature. It is true, as Henoch has said, that scarlet fever in itself is of such a nature that certain complications are liable to occur with the most judicious hygienic treatment. The best management does not always prevent the occurrence of otitis media or nephritis produced by the scarlatinous or secondary microbes. Still, it is the common belief—and my observations, extending through a third of a century, are in conformity with this belief—that careless exposure of patients to currents of air, or change from a warm to a cold air, as in mild cases when the presence of scarlet fever is not suspected, increases the liability to certain inflammatory complications, particularly to rheumatism and nephritis. The patient should therefore be in bed, lightly covered, during the active period of the disease; that is, from nine to twelve days. He should remain in his room so long as desquamation is going on—that is, from four to six weeks—and in inclement weather he should not go abroad until even a longer period has elapsed. When he leaves the house he should be warmly clothed.

Therapeutic Measures.—In order to treat scarlet fever successfully it is necessary to bear in mind that it is a self-limited disease, running a certain course and through certain stages, and that it is not abbreviated by any known treatment. Therapeutic measures can only moderate its symptoms and render it milder. The severity of the disease is indicated by its symptoms, and the symptoms are to a certain extent under our control.

Mild Cases.—A patient with a temperature under 103°, and with only a moderate angina, does not require active treatment; but, however light the disease, we have stated above that he should always be in bed and in a room of uniform temperature. Instances have come to my notice in which scarlet fever was not diagnosticated, and the patients were allowed to go about the house, and even in the open air, in the eruptive stage, till some severe complication or an aggravation of the type created alarm, and medical advice was sought, when it appeared that a grave and dangerous condition had, through carelessness and ignorance, resulted from a mild and favorable form of scarlatina. The physician, when summoned to a case, however mild, should never fail to take the temperature, note the pulse, inspect the fauces, and inquire in reference to the fæcal and urinary evacuations, that he may detect early any unfavorable changes which may occur.

Since in all cases angina and more or less blood-deterioration are

present, the following prescription will be found useful in mild as well as severe scarlet fever:

℞. Potassii chloratis, gr. xv to xx;
Tinct. ferri chloridi, fʒij;
Glycerini, fʒss;
Aquæ, fʒiiiss.—M.
Sig. Dose, one tea-spoonful every hour to two hours for a child of three years.

Glycerin and water appears to be a better vehicle in the above prescription than simple syrup, since it is more penetrating. Small doses of this medicine, frequently administered, act beneficially on the surface of the throat, and tend to prevent the anæmia which is so common after scarlet fever. If the medicine be given gradually, or if the patient gargle with it before swallowing, and no drink be given subsequently for a few minutes, a better effect is obtained upon the inflamed fauces. Potassium chlorate in large doses is known to be an irritant to the kidneys, causing intense hyperæmia of these organs, with bloody urine or suppression of urine. The melancholy fate of Fountaine, who died from the effects of one ounce of this drug, is known to the profession. I have seen a similar instance in a child. But doses of ½ to 1 grain can apparently be administered with safety to children, so that not more than 15 to 20 grains are given in twenty-four hours. A quantity much exceeding this involves risk. In mild cases quinine is, I think, useful as a tonic and an aid in maintaining a mild type of the disease. I have employed the following prescription:

℞. Quininæ sulphat., gr. xvj;
Syr. pruni Virginiani,
Syr. yerbæ santæ, āā. fʒj.—M.
Sig. Dose, one tea-spoonful every three or four hours to a child of three to five years.

The iron mixture, with or without the potassium chlorate, should be administered twice between the doses of quinine. In mild as well as in severe scarlet fever antiseptic measures are required to prevent auto-infection, as well as to prevent the propagation of the disease to others. The itching and dryness of the surface, which increase the discomfort of the patient in mild as well as in severe scarlatina, are relieved by rubbing the surface every two or three hours with a mixture consisting of 1 drachm of carbolic acid, 1 drachm of oil of eucalyptus, and 7 ounces of sweet oil, which should be well shaken before it is used. The following mixture, applied over the entire surface

every hour or every two or three hours, also relieves the burning and itching, while it has antiseptic properties:

℞. Acidi carbolici, ʒj;
Tinct. camphor., fʒij;
Aquæ puræ, Oj.—M.
Sig. Shake well before using, and apply over surface when needed for the pruritus.

Frequent antiseptic treatment of the fauces from the commencement of scarlet fever and during its progress, in mild as well as in severe cases, must be regarded as among the most important of the recent improvements in the treatment of this disease. Fränkel and Freudenberg[1] and Professor Hutinel of Paris—the last of whom has charge of the Pavilion for the treatment of the scarlatinal patients connected with L'Hôpital des Enfants malades—may be mentioned among those who recommend the early and frequent application of disinfectants to the fauces as a means of diminishing the severity of scarlet fever and preventing complications. The secretions from the faucial surface, and the faucial surface itself, contain numerous streptococci and certain other microbes. The streptococci greatly predominate, and are apparently active agents in producing the inflammation. Professor Hutinel says: "The micro-organism of scarlet fever is not yet isolated, but now we know the germs that are found in the lesions produced by the usual complications of the disease. In nearly all the cases of adenitis, arthritis, nephritis, endocarditis, and pleuritis from scarlatina the bacteriological examination has shown a streptococcus that is very much like, if it is not the same as, Rosenbach's pyogenic streptococcus." This is, adds Hutinel, constantly seen in the pharynx when the disease begins, and it certainly plays an important part in the genesis of the inflammations that are seen there.[2]

In the *Revue Mensual des Malades de l'Enfance*, July, 1886, Fränkel and Freudenberg relate the results of their microscopic examination of cases of scarlet fever that died when the eruption was passing off. They found large numbers of streptococci in different organs; and these organisms presented the peculiarities of the streptococci of pus. The number of micro-organisms corresponded with the intensity of the inflammation, and they found large numbers of micrococci in the lymphatic glands in the immediate vicinity of the pharynx. These authors state that their observations teach them that in order to prevent secondary infection the physician must vigorously treat the local changes in the pharynx and adjacent parts from the beginning of scarlet fever.

[1] *Rev. Mens. des Mal. de l'Enf.*, July, 1886.
[2] *Archives of Pediatrics*, Sept., 1890.

Recent bacteriological investigations in reference to scarlet fever, therefore, have shown that microbes occur abundantly upon the inflamed faucial surface in this disease, and that of these microbes the streptococcus which is apparently identical with that which occurs in suppurative processes is the most abundant. Moreover, in the adenitis, cellulitis, and other internal inflammations which occur as complications or sequelæ of scarlet fever, the streptococcus abounds, according to the statement of the microscopists from whom we have quoted and others. All physicians know that scarlet fever, more than any other disease, is liable to be complicated and followed by inflammations which greatly increase its gravity and mortality; and the theory that the microbes which cause these inflammations originate to a great extent upon the inflamed faucial and nasal surfaces receives support from recent investigations. Even if the advocates of this theory have exaggerated the facts, we cannot, I think, fail to see in the present status of our knowledge that early and frequent disinfection of the fauces and nares in scarlet fever is of the highest importance as a means of diminishing the nasal and faucial inflammation, and diminishing or preventing inflammation of the Eustachian tube and middle ear, as well as of the lymphatic glands and the connective tissue of the neck. The best mode of treatment appears to be spraying or irrigation every half hour or hour with the peroxide of hydrogen, 1 part to 4 of water for the fauces, 1 part to 8 of water for the nares, or with some other non-irritating but efficient disinfectant. This local, non-irritating, antiseptic treatment should be perseveringly employed from the first visit in mild as well as in severe cases. We will return to this subject when treating of the complications.

Severe Cases.—The successful treatment of severe forms of scarlet fever requires not only skill and experience, but visits sufficiently prolonged or frequent to observe fully the symptoms and type of the disease and the effect of remedies. In the treatment of no other malady are sound judgment and correct discrimination more urgently needed than in scarlet fever of a severe type. The indications of treatment, so far as the patient is concerned, are—1st. To diminish to a safe degree the anatomical characters and symptoms; 2d. To sustain the strength or vital powers while the disease is running its course; 3d. To prevent complications and sequelæ.

Fever diminishes the secretions by which food is digested and destroys the appetite, so that repair of the waste is insufficient. Hence the progressive emaciation and loss of weight which attend the febrile state. Moreover, a high temperature, continuing for a time, tends to produce degenerative changes, albuminous and fatty, in the tissues—the higher the temperature, the more rapid the change—so that the functions of organs are seriously impaired. Billroth

says: "The production of heat depends chiefly on oxidation of the constituents of the body." Therefore fever indicates an increase of the oxidation and a molecular disintegration above the healthy standard.

Among the most dangerous of the tissue-changes produced by fever is granulo-fatty degeneration of the muscular fibres of the heart. In dogs and rabbits that have perished from a high temperature artificially produced by experimenters, granular clouding of the elementary tissues has been found after death.[1] A high temperature, therefore, in itself involves danger, and if it occur in an ataxic disease like scarlet fever, and be protracted, it greatly diminishes the chances of a favorable termination. Therefore measures designed to reduce the temperature when it has attained a high range are urgently needed.

The Use of Water.—The temperature can be reduced without shock or injury to the patient by the judicious use of cold water externally. It is to be remembered that a temperature at or below 103° does not urgently require reduction, since it is a grade of animal heat that is safely borne a few days. Nevertheless, patients with a temperature of 102° or 103° experience relief from sponging the fingers, hands, arms, forehead, neck, and face with cold water, to which vinegar or alcohol is added. The higher the temperature above 103°, the more urgently is its reduction required, but methods should be employed that do not shock or excite the child or weaken the pulse.

Before applying the water treatment for the reduction of temperature, the state of the patient as regards his strength and ability to react should be carefully ascertained. In grave or so-called malignant scarlet fever two forms of hyperpyrexia occur—namely, the sthenic and asthenic. The treatment by water, or by antipyretic medicines which may be proper for the sthenic cases, may be injurious for the asthenic, producing even fatal collapse. In sthenic cases, although the temperature may rise to 105° or higher, and the patient is restless or somnolent and restless alternately, and delirious, the pulse, though rapid, is strong and full; the rash has a bright-red color, and when removed by pressure with the finger, it immediately returns when the pressure is withdrawn. In such cases there is little danger of producing heart failure by the cold-water treatment. In asthenic cases delirium and restlessness or somnolence are also present, but the rapid pulse is easily compressed, the temperature is elevated to a dangerous degree, the skin has a dusky-red color, and the capillary circulation is sluggish. In such cases the injudicious use of cold water may cause such depression that the patient rallies with difficulty, or he may pass into a state of collapse and die. Although the internal temperature is dangerously high, that of the extremities may not be notably increased, and they

[1] "Experiments of Mr. Legg," *Lond. Path. Soc. Trans.*, vol. xxiv., and others.

are sometimes cool and livid. The cold-water treatment of such patients is pernicious, but hot applications to the extremities, with brisk friction, are grateful to the patient and useful in improving the circulation.

Dr. Currie of Liverpool first employed water as a therapeutic agent in scarlet fever in the commencement of the present century. When summoned at the beginning of a case he ordered the patient to be stripped, placed in a bath-tub, and five or six pailfuls of water at a temperature of from 68° to 77° Fahr. were thrown over his body during a quarter of a minute to one minute. The patient was immediately returned to bed and wrapped in blankets without being dried. Reaction generally occurred within fifteen or twenty minutes, and the affusion was usually repeated once or twice in twenty-four hours. When the parents objected to this treatment, and also when the attack had continued a few days, he employed tepid instead of cool water.

Currie stated that he treated in this manner 150 patients between the years 1801 and 1804, always with a good result. But more recent observations have shown that a uniformly good result is far from being obtained by any mode of employing water. Nevertheless, through the alleged benefit obtained by Dr. Currie, the cold-water treatment of scarlet fever came into use, and it has been continuously employed until the present time, often with benefit, but sometimes with harm, and even death. Trousseau, commenting on the treatment introduced by Currie, states that a large proportion of the severe cases with very hot skin and marked nervous symptoms, although benefited by the cold affusions, nevertheless perish; and public opinion is so averse to treatment by cold water that the physician who recommends it is likely to be strongly censured. In order to avoid censure, Trousseau says: "Very well, then, in place of giving your patients cold affusions, give them mere lotions of water at 25° (77° Fahr.). . . . . Let the patient be placed on a folding bed, and then let the entire body, first the anterior and then the posterior surface, be rapidly wetted with sponges soaked in this water, ... following the same rule as after the cold affusion." Trousseau speaks of the benefit derived from such treatment in diminishing the "extreme aridity and stinging heat," the skin becoming cooler and moist, and the cerebral symptoms diminishing, as also the diarrhœa and vomiting.

Von Ziemssen recommends the immersion of the patient in water at a temperature of 90°, and the gradual addition of cool water until the temperature of the bath falls to 77°. In a few minutes the patient is returned to bed and covered with bed-clothes, when the temperature will be found reduced two or two and a half degrees. If the patient complain of chilliness or his pulse be feeble, he should be immediately removed from the bath and whiskey or brandy administered; for if

the extremities remain cool and the capillary circulation sluggish, collapse may occur or some internal inflammation may arise. Ziemssen, like other physicians of experience, has discarded the use of cold water in adynamic cases when the pulse is weak, the surface dusky, and the capillary circulation sluggish, but uses instead hot or warm water and alcohol to the extremities.

Professor Henoch, in his treatise on *Diseases of Children*, American edition, says: "If the fever continue high, and the apparently malignant symptoms described above develop, the head should be covered by an ice-bag, ... and the child placed in a lukewarm bath, not under 25° R. (88.25° F.). I decidedly oppose cooler baths, because in scarlatina, which presents a tendency to heart failure, cold may produce an unexpected rapid collapse, more than in any other affection." In his more recent treatise, published by the New Sydenham Society, he also states that he does not approve of baths at a lower temperature than 88° Fahr. He says that on several occasions he has known collapse to occur while patients were in the bath, and in one instance death resulted.

Dr. K. Reimer of the Nikoläsvsky Hospital, St. Petersburg, read an elaborate paper on scarlet fever at the Third General Meeting of the Russian Medical Men, giving his observations during the twenty years ending with 1888. The paper was published in the *Transactions* of that society. He states that he has examined the effects of water in 978 grave or hyperpyretic cases of scarlet fever. Cold compresses to the head, neck, chest, and abdomen, and cold ablutions to other parts, have a soothing effect on the nervous system, but do not shorten the duration of the fever. The cold pack employed in 28 cases of great nervous excitement was followed not infrequently by cyanosis and heart failure. A cold pack prolonged an hour or more sometimes ended in fatal collapse. The cold pack, with cold irrigation, employed in 131 cases, was satisfactory as regards the pulse, circulation, and respiration, but it exerted little influence on the subsequent course of the fever. A tepid bath, employed in 72 cases, was useless, and was decidedly injurious if continued more than half an hour, causing a weak pulse. A bath of 95° F., gradually cooled to 81° F., or 75° F., employed in 186 cases, caused collapse and sudden death more frequently than any other hydrotherapeutic measure. A cold bath of from 64° F. to 75° F., continued from five to eight minutes, accompanied by energetic friction over the whole body, employed in 363 cases, gave the best results of all the modes of applying water. It caused a decrease of 3.6° F. in the temperature, as well as improvement in the pulse and respiration. Dr. Reimer adds that the cold bath in the hyperpyretic cases has a good and powerful effect on the nervous system, particularly upon the nervous centres that control the circulation; but he adds that the proper

mode of applying the water treatment must be determined by examining the peculiarities of each case.

Guided by the experience of such men as Trousseau and Henoch, are we able to formulate a method of employing water as an antipyretic in scarlet fever which we can confidently recommend to the profession? In all hyperpyretic cases of scarlatina, whether the form be sthenic or asthenic, accompanied by either restlessness or somnolence and delirium, an ice-bag or its equivalent, a linen or silk handkerchief wrung out of ice-water every five to ten minutes, should be constantly applied over the head as long as the temperature remains at or above 103°. The ice-bag should be about one-third full, so that it fits over the head like a cap. If a handkerchief be used, the popular objection to the use of cold may be in a measure overcome by adding one-fifth part of alcohol to the water, or, as Henoch recommends, adding vinegar to it. At the same time, as a potent means of abstracting heat, at least when the temperature is at or over 104°, a similar application should be made around the neck, and especially along its sides. Cold applied over the great vessels of the neck, the jugulars and carotids, promptly abstracts heat from the blood, while it diminishes the pharyngitis, adenitis, and cellulitis; which is an important gain. In sthenic cases, in which the extremities have a pungent heat, a bright-red color, and active circulation, the limbs should be frequently sponged with the cool lotion containing alcohol or vinegar. If the temperature with this treatment be not sufficiently reduced, the hands and forearms may be immersed in the lotion while the patient is still in bed, or a double thickness of muslin or linen, frequently wrung out of ice-water, may be placed over the hands and arms. This treatment is grateful to the patient, is not attended by any shock, and, continued two or three hours, it usually reduces the temperature two or more degrees.

In asthenic cases, with a dusky color of the skin, a sluggish capillary circulation, coolness of the extremities, or a pungent heat, cold applications, although beneficial when applied to the head and neck, are likely to be injurious if applied to the extremities. On the other hand, the frequent application to the extremities in these asthenic cases of tepid or hot water, with brisk friction, as recommended by Ziemssen and others, accelerates the flow of blood, revives the functional activity in the torpid limbs, and is evidently useful. Allowing the hyperpyretic patient to hold in the mouth and swallow pieces of ice has been a common practice for a long time and is very agreeable. I would also recommend for such a patient, especially when emesis is present and the quantity of nutriment retained is insufficient, a clyster every third hour of ice-cold peptonized milk containing one of the sarco-peptones. With proper precautions and discrimination of cases the use of water

in the way which has been described, where no renal complication exists, is, I think, entirely safe. I do not recollect that I have ever observed collapse, which has prejudiced so many good observers against its use, resulting from it when applied in the manner and with the precautions which I have mentioned.

Antipyretics.—The medicinal agents which have been most extensively used for the reduction of temperature in scarlet fever until within a recent period are quinine and aconite. One of these is regarded as a tonic, and the other is not actively depressing if given in proper doses, especially if combined with a small amount of alcoholic stimulant or digitalis. Veratrum viride, the American hellebore, was for a short time employed in this country, at least in New York, in hyperpyretic scarlet fever, but those who prescribed it subsequently discarded its use, since it is dangerously depressing and is liable to cause collapse. During the last three or four years three other powerful antipyretics have been extensively employed—antipyrine, antifebrin, and phenacetin. The time has arrived when the exact therapeutic uses of these agents should be ascertained. Von Ziemssen,[1] while he recommends hydrotherapeutic treatment of scarlet fever, expresses the opinion that antipyretic drugs are of secondary importance. In his recent treatise on the *Diseases of Children*, published by the New Sydenham Society, Henoch states that if the fever be persistently high, accompanied by drowsiness, restlessness, or delirium, he applies an ice-bag, gives quinine, 7 to 15½ grains, or antipyrine, 3½ to 7½ grains, or antefebrin, 1½ to 4½ grains. But he adds that antipyretic treatment does not succeed in the really malignant cases. In the treatment of such patients, he says, "I have never seen any successful result from the use of large doses of quinine, internally or subcutaneously, and I regard salicylate of sodium, as well as antipyrine and antifebrin, as remedies which are dangerous in such cases, and may favor the occurrence of collapse." Reimer, whose paper relating to scarlet fever, based on the analysis of 3640 cases, has already been alluded to, says that quinine employed in 148 cases, either by the mouth, rectum, or subcutaneously, had no notable effect on the temperature during the period of efflorescence, but was somewhat more efficient in the period of defervescence. The salicylate of sodium, employed by him in 431 cases, was injurious in its action on the heart, sometimes causing a cyanotic hue and heart failure. Kairin, employed in 36 cases, exerted a still more injurious action upon the heart, and it retarded respiration, while it had little influence on the fever. Thallin, employed in 48 cases, was unreliable and inconstant as regards its action on the temperature, in some cases not diminishing it, but in other cases rendering it subnormal, with symptoms of collapse. Reimer states that antipyrine was

[1] *Janunberg klinische Vorträge*, No. xiv.

employed in 684 cases, without abridging the course of the fever, but it seemed to enable patients to cope better with severe complications. He obtained more satisfactory results from antipyrine than from any other antipyretic medicine. The effects of antifebrin, prescribed in 522 cases, were not so good. It was more likely than antipyrine to cause cyanosis and a weak pulse.

Notwithstanding these adverse opinions, there is, I think, sufficient evidence that two antipyretic drugs are useful in certain cases, so that they may be confidently recommended to the profession. These medicines are aconite and phenacetin. Neither of them should probably be given in cases of extreme malignancy, characterized by feeble pulse, dusky color of the skin, sluggish capillary circulation, and delirium, with great restlessness or coma; but in hyperpyretic cases not markedly adynamic or malignant these remedies are apparently sometimes useful. In his interesting paper on the treatment of scarlet fever, read before the American Pediatric Society in 1889, Dr. Fruitnight stated that he had records of 63 cases of scarlet fever treated with aconite, with only 3 deaths. He had employed antipyrine and antifebrin in a considerable number of cases, but discarded them on account of the symptoms of cardiac depression and collapse which they sometimes caused. Dr. Fruitnight gives a table of cases showing the reduction of temperature produced by aconite. A child under the age of three years requires half a drop, and above the age of three years one drop, of the tincture of the aconite-root from every hour to three hours in the commencement of the attack. As the fever abates the interval between the doses should be longer. As stated elsewhere, it is not necessary to use the aconite or other antipyretic if the temperature does not exceed 104°. If there be asthenic symptoms, it should be administered with an alcoholic stimulant. I have also observed good results from phenacetin, administered in $\frac{1}{2}$-grain doses to a child of eighteen months, and in 1-grain doses to children at the age of three to five years, every two or three hours, with an alcoholic stimulant. I repeat that in cases attended by marked depression it should not be prescribed, or it should be prescribed in small doses, its effects being carefully watched and an alcoholic stimulant be employed at the same time.

The Bromides.—If the patient be restless and delirious, and especially if he have jactitation, which is often a forerunner of convulsions, the bromide of sodium or potassium should be prescribed in doses of 5 grains every two hours for a child of three to five years. If the temperature be at or above 105°, and not reduced by the cold-water treatment, aconite or phenacetin may in some cases be advantageously employed at the same time. If convulsions occur, which in the commencement of scarlet fever result from the high temperature and the profound blood-poisoning, and at a later stage are uræmic, one of the

bromides in large doses, repeated every five or ten minutes, is an important remedy, while measures designed to remove the cause of the convulsions should also be promptly employed.

Digitalis.—Dr. Busey, in his article on scarlet fever in the *Cyclopædia of Diseases of Children*, says: "Digitalis is oftentimes not only necessary, but imperatively demanded, and may be given in very decided doses." Mr. Line, in his clinical notes based on 1000 cases, published in the *Birmingham Medical Review*, April, 1887, mentions digitalis among the useful remedies. Trousseau, Von Ziemssen, Cadet de Gassicourt, and West do not, so far as I am able to discover, mention digitalis among the remedies for uncomplicated scarlet fever, while a considerable number of physicians—among whom may be mentioned Rilliet and Barthez and Eustace Smith—recommend its use for scarlatinal nephritis. Stillé and Maisch say of the use of digitalis in typhoid fever: "Even its advocates have not shown that it abridges the disease or lessens its mortality, while it is abundantly demonstrated to impair the digestion, reduce the strength, and even to occasion sudden death. The use of digitalis in other forms of fever is equally unsatisfactory, and justifies the judgment of Traube, that the true field of action for digitalis is not fever." The condemnation of the use of digitalis by such high authorities in therapeutics should certainly be thoughtfully considered. I am not aware that I have observed any decided benefit from the use of digitalis in scarlet fever when uncomplicated by nephritis or uræmic symptoms, and, as we have other important remedies for every indication, it should probably seldom be prescribed for scarlatinal patients except as a remedy for nephritis.

Carbonate of Ammonium, Aromatic Spirit of Ammonia, Musk, and Camphor.—In severe cases with frequent and rapid pulse, in which antemortem heart-clots are liable to occur, ammonium carbonate is often useful. It should be dissolved in water and given in milk in as large doses as 3 grains every hour or second hour to a child of five years. It aids in producing stronger contraction of the cardiac muscular fibres, and thus diminishes the danger of the formation of thrombi. Ten-drop doses of the aromatic spirit of ammonia, given also in milk or in sweetened water, the vehicle being in sufficient quantity to prevent gastritis from the highly irritating nature of ammonia, may be prescribed as a substitute for the carbonate. The carbonate of ammonium has long been employed as a cardiac stimulant in scarlatina. In 1843, Rieckon of Brussels stated that in certain epidemics he had employed it with great success.[1] Rilliet and Barthez also prescribed it previously to 1861, but they state that it was most frequently unsuccessful in asthenic cases. Wendt also previously to 1861 recommended it in combination with musk. Nevertheless, other good observers speak doubtfully or dis-

[1] *Journ. des Conn. Méd.-chir.*, 1843.

paragingly of ammonium. Henoch says that he attaches little importance to carbonate of ammonium or to valerian, because they are too weak. Vidal[1] states that carbonate of ammonium was recommended twenty-five years ago as a remedy in scarlatina and other infectious diseases, but that experience has not confirmed its value. He, however, highly recommends the acetate of ammonium, formed by the combination of the carbonate of ammonium with acetic acid, given in doses of 15 grains for each year of the patient's age. A solution of this drug, known as spirit of Mindererus, has been considerably employed in America. Vidal states that it rapidly lowers the temperature, and is most effectual when employed near the commencement of the attack. Each table-spoonful of the spiritus Mindereri contains 10 grains of the carbonate of ammonium, neutralized by acetic acid. Judging from my own experience, and from what I can learn of the results obtained from carbonate of ammonium by others, I believe that it is a useful remedy as a cardiac stimulant, but inferior to the alcoholic preparations. I continue to use it in certain cases, prescribing it, as stated above, dissolved in water and given in milk.

Musk in doses of $\frac{3}{4}$ of a grain to 3 grains every two hours was at one time considerably employed, but it appears to be inferior in its action to camphor. Camphor should be prescribed in 1- or 2-grain doses every two hours. It may be employed hypodermically, as recommended by Henoch, dissolved in five times its quantity of rectified spirit and the same quantity of water.

Alcohol.—Alcohol, whether administered in one of the stronger wines, as sherry, or in whiskey or brandy, is a most useful remedy in scarlet fever, and is indeed indispensable in all grave cases which are attended by feeble capillary circulation and evidences of prostration. Milk is the best vehicle for this agent. Wine-whey or milk-punch should be given every hour or second hour. In scarlet fever, as well as in diphtheria, comparatively large doses are required, as a tea-spoonful of whiskey or brandy every hour or second hour for a child of five years.

In our remarks on the treatment of mild scarlet fever we spoke of the importance of making frequent non-irritating antiseptic applications to the inflamed fauces and nares. In cases of severe or malignant type, attended by infiltration and swelling, and perhaps necrosis of the faucial surface, it is still more important that an antiseptic spray should be frequently employed, so as to destroy all microbes that are accessible.

During convalescence the hygienic treatment already described is important. Nutritious diet and a moderate amount of alcoholic stimulants are required, while the patient is kept indoors and protected from currents of air as long as desquamation is occurring, which may be

[1] *Bullétin de Thérap.*, Oct, 25, 1890.

six or eight weeks. More or less anæmia is present in convalescing patients, so that a mild tonic containing iron will aid in restoring the health. Elixir of calisaya-bark and iron, preparations of beef, iron, and wine, or the liquor ferri peptonati in tea-spoonful doses, will be found useful under such circumstances.

Complications and Sequelæ.

In the preceding pages we have recommended local measures designed to diminish or cure the pharyngeal and nasal catarrh, believing that the complications and sequelæ affecting internal organs, from which many patients die, have in a considerable degree a microbic origin; and it is probable, as we have already stated, that the microbes which produce this result are to a large extent propagated from the faucial and nasal surfaces. We have related in a preceding page the observations of Fränkel, Freudenberg, and Hutinel, showing the presence of microbes at the seat of internal inflammations which occur as complications of scarlet fever, and the probable microbic origin of at least some of these inflammations. This subject is so important that we feel justified in relating the following additional observations bearing upon this matter: In 7 cases of suppurative adenitis Raskin found the streptococcus constantly present. Lenhartz,[1] in an interesting paper on secondary affections in scarlet fever, says that he obtained from sections of affected organs a micrococcus from which cultures were made. It greatly resembled the erysipelas coccus of Fehleisen. Moreover, inoculations of mice made with pure cultures of it produced fatal erysipelas. The bacteriological investigations of Babes in scarlatina, which are corroborative of those already detailed, might also be related.

Guinon says: "Secondary infection in this disease usually occurs by way of the pharynx, and the penetration of microbes is favored by the loss of epithelium, by the dilatation of the lymph-channels, and the recumbency." Hence local antiseptic treatment of the nares and fauces is proper in all cases as soon as the inflammation appears, but it is especially required in the anginose form of scarlet fever, in which the inflamed surface is greatly thickened, is covered with foul secretions, and perhaps contains patches of pseudo-membrane or of necrosed tissue. Formerly, before the invention of hand-atomizers, it was necessary in making applications to the fauces to employ a brush, probang, or swab for those too young to use a gargle; but hand-atomizers, which are now in common use, afford a quick and easy method for making such applications. Four or five compressions of the bulb of an atomizer are sufficient to cover the fauces with the spray. Those atomizers with hard or bulbous tips are preferable, since those with slen-

[1] *Jahrb. f. Kinderheil.*, Bd. xxviii.

der metallic points are likely to prick the buccal or facial surface if the child resist and toss the head; but this accident may be prevented by directing India-rubber tubing to be drawn over the point in such a way as not to obstruct its action. For the local treatment of the fauces we employ and recommend, as stated in a preceding page, 1 part of peroxide of hydrogen and 3 or 4 of water every hour, or even half hour when the patient is awake.

The following mixture is also beneficial for local treatment of the fauces when they are foul and offensive from the exudations and secretions. It should be applied by a large camel's-hair pencil every three to six hours:

℞. Acidi carbolici, gtt. x;
Liq. ferri subsulphatis, fʒiij;
Glycerini,
Aquæ puræ, āā. fʒj.—M.

Coryza.—In the first days of scarlet fever the coryza is slight, and no discharge from the nostrils occurs, so that mild preventive nasal injections three or four times daily suffice. But before the termination of the malady in cases of ordinary severity a nasal discharge usually supervenes, producing more or less redness and excoriation around the orifice of the nares. The coryza is most severe, and is attended with the greatest amount of nasal discharge in cases of the anginose type. Also in cases in which diphtheria supervenes this disease attacks the nasal surface, and requires prompt treatment by sprays or douches. It should be remembered that the Schneiderian membrane is midway in sensitiveness, as it is in location, between the conjunctival and buccal surfaces, and is readily inflamed by irritating applications. Applications made to it must be much milder than such as the fauces tolerate. They should always be applied warm, and a tea-spoonful of any mixture properly employed is sufficient for each nostril at one application. The applications should be made every two to four hours, according to the gravity of the case and the amount of the discharge. The best instrument for this purpose is a small syringe of glass with a curved neck and bulbous tip. The child's head should be thrown back, and the piston depressed rapidly so as thoroughly to wash out the nasal cavity. The application can also be made through an atomizer with a rounded tip or a tip covered by rubber tubing. The following is a useful prescription:

℞. Acidi borici, ʒj;
Sodii borat., ʒij;
Aquæ puræ, Oj.—M.

Common salt, 1 drachm to 1 pint of warm water, has also been successfully used, and recently the peroxide of hydrogen, 1 part to 8 or 10 of warm water.

Otitis Media.—It is evident that the condition of the ear should be closely observed in and after scarlet fever. If the patient have earache, considerable relief may be obtained in the commencement by dropping a few minims of laudanum and sweet oil into the ear, and covering it by some hot application, either dry or moist, which will retain the heat. A light bag containing heated table salt or dry and hot chamomile-flowers will answer the purpose. Water as hot as can be well tolerated dropped into the ear or allowed to trickle from a fountain syringe, so as to fill the ear, is also very beneficial in allaying the pain. A 4 per cent. solution of nitrate of cocaine, with an equal quantity of laudanum, dropped into the ear will often give considerable relief. If the hot applications are not well borne, Dr. C. H. May recommends applying a long and narrow ice-bag immediately behind the auricle and extending under and in front of the ear, so as to cover the temporo-maxillary region, and at the same time instilling into the ear hot salt water (℥j to Oj) to which laudanum or cocaine is added.[1] Dr. May also states that antipyrine in large doses is useful in relieving the pain. If the pain be not quickly relieved, a leech should be applied at the base of the tragus. O. D. Pomeroy, an experienced aurist of New York, says: "Leeching, employed at the right time, rarely fails to subdue the pain and inflammation. The posterior face of the tragus is ordinarily the best place for applying the leech, but it may be applied in front of the ear or behind, wherever the tenderness on pressure is greatest. In my opinion, paracentesis may frequently be rendered unnecessary by the timely use of one or two leeches applied to the meatus."

If the otitis continue, as shown by pain in the ear, of which children old enough to speak bitterly complain, and which causes those too young to speak to press their fingers into or against their ears, this inflammation should not be neglected, as it may involve serious consequences. Multitudes of children have had permanent impairment, or even loss, of hearing, with caries or necrosis of the walls of the middle ear and of the mastoid cells, which might have been prevented by prompt and skilful management of the ear in the early stage of the inflammation. If, therefore, the otitis continue without mitigation of pain after the foregoing measures have been employed, paracentesis of the drumhead is probably required. The following directions for performing this operation, which will be useful to country practitioners who may not be able to obtain the assistance of a specialist, are furnished by Dr. Pomeroy: "The forehead mirror should be worn, in order to leave

[1] Pediatric Section of the N. Y. Acad. of Med., March 14, 1889.

the hand free to operate by either artificial light or daylight. A good-sized speculum is introduced into the meatus. Then an ordinary broad needle, about one line in diameter, with a shank of about two inches, such as oculists use for puncturing the cornea, should be held between the thumb and fingers, lightly pressed, so as not to dull delicate tactile sensibility. The part being well under light, the most bulging portion of the membrane should be lightly and quickly punctured with a very slight amount of force. The posterior and superior portion of the membrane is the most likely to bulge. The chordæ tympani nerve ordinarily lies too high up to be wounded. The ossicles are avoided by selecting a posterior portion of the membrane. After puncture the ear should be inflated by an ear-bag whose nozzle is inserted into a nostril, both nostrils being closed, so as to force the fluid from the tympanum. The puncture may need to be repeated at intervals of a day or two, provided that the pain and bulging return."

Albert H. Buck of New York, in an instructive paper read before the International Medical Congress in 1876, writes as follows of paracentesis of the membrana tympani in scarlatinous otitis: "In this one slight operation, which in itself is neither dangerous nor very painful, lies the power to prevent the whole train of disagreeable and dangerous symptoms." Buck relates the following example: A child of three years had complained of earache about twenty-four hours. "Toward morning," says he, "I was sent for, as the pain had become constant. . . . . An examination with the speculum and reflected light showed an œdematous and bulging membrana tympani (posterior half), the neighboring parts being very red, though as yet but little swollen. In the most prominent portion of the membrane I made an incision scarcely three millimetres (one-tenth inch) in length, and involving simply the different layers of the membrana tympani. This was almost immediately followed by a watery discharge (without the aid of inflation), which ran down the child's cheek. At the end of three or four minutes the child had ceased crying, and in less than a quarter of an hour she was fast asleep. At first the discharge was very abundant, and mainly watery in character, but it steadily diminished in quantity and became thicker, till finally, on the fourth day, it ceased altogether. On the tenth day the most careful examination of the ear could not detect any trace of either the inflammation or the artificial opening. The ear had probably been saved from ulceration of the drum membrane, long-continued suppurative otitis, and perhaps permanent impairment of hearing."

When an opening has been made in the membrana tympani, either by incision or ulceration, it is advisable in some instances to inflate the tympanum by Politzer's method, which has been alluded to above. The nozzle attached to an India-rubber bag is introduced into

the nostril on the affected side, and both nostrils are compressed against it. The patient fills his mouth with water, which he swallows at a given signal, as after the words *one, two, three,* spoken by the operator. During the act of swallowing, which opens the Eustachian tube, the rubber bag is forcibly compressed, which forces the air along the tube into the middle ear, and facilitates the escape of the pent-up secretions in the tympanic cavity. Dr. May recommends cleansing the nostrils and pharynx with a warm solution of common salt, one drachm to the pint, before the use of Politzer's bag.

If the otitis have continued unchecked by treatment until the secretions within it, after days and nights of suffering, have escaped by ulceration through the drumhead, the opportunity for prompt and certain cure is passed. Still, the patient under these circumstances may soon recover, or there may be the other alternative, in which the ear is badly damaged and chronic inflammation, established in the walls of the tympanum, gives rise to an offensive and protracted otorrhœa. In this state of the ear internal remedies should be prescribed, such as surgeons employ in suppurative inflammation of bones occurring in other parts of the system. Cod-liver oil and syrup of the iodide of iron are required, especially by patients of the strumous diathesis, the object being to promote a more healthy state of the system, so as to prevent extension of the inflammation and facilitate the healing process. Carbolized lotions, as the following, syringed warm into the ear in which there is otorrhœa, are useful in promoting cleanliness and increasing the comfort of the patient:

℞. Acidi carbolici, ʒss;
Glycerini, fʒij;
Aquæ, fʒiv.—M.

But a safe, painless, and effectual agent for local treatment has been discovered in boric acid, by the use of which the discharge quickly diminishes, and the condition of the ear more certainly and rapidly improves than by the use of the carbolized lotions:

℞. Acidi borici, ʒiiss;
Glycerini,
Aquæ, *āā.* fʒj.—M.
Sig. Instil sufficient to fill the external ear three or four times daily.

Before the instillation is made the ear should be cleaned by syringing slowly with a wine-glassful of water, to which half a tea-spoonful of boric acid has been added, and the ear is then dried by pressure with a napkin. Some aurists employ finely-triturated powder of

boric acid dusted into the ear. The patient lies upon the side with the affected ear uppermost. By means of a scoop made of stiff paper or the segment of a quill as much of the powder is introduced into the ear as will cover a five-cent piece. By moving the ear it descends to the drumhead.

The following astringent has also been employed with good effect for the otorrhœa resulting from scarlet fever, as also in that from other causes:

℞. Zinci sulphatis,
Aluminis, āā. gr. v;
Aquæ puræ, f℥j.—M.

A few minims of this should be dropped into the ear, or if the ear be sensitive and painful 5 drops should be added to a tea-spoonful of warm water and dropped or syringed into the ear. But in protracted otorrhœa with granulations, which does not yield to the above treatment, aurists have successfully employed iodoform or its modified form, aristol. The ear should first be thoroughly cleansed by syringing with warm water and dried, and iodoform, to which a little balsam of Peru is added to mask the disagreeable odor, or aristol, should be pressed down to the bottom of the auditory canal by any convenient instrument. It is anodyne, astringent, and disinfectant, and should be employed in a dry state in considerable quantity.

The sequelæ of otitis media, such as granulations sprouting out from the drumhead, some of which may be of large size and are known as polypi, may require treatment by the aurist. A polypus may sometimes be removed by the forceps, or, better, by the snare. Polypi not large and favorably located can sometimes be cured by an astringent powder, as iodoform, sulphate of zinc, or alum, or by applying the liquid subsulphate of iron, considerably diluted. The otitis externa produced by the irritating discharge which flows from the middle ear soon disappears when the flow ceases.

Cellulitis, Adenitis.—Since the inflammation of the connective tissue and the lymphatic glands of the neck originates to a great extent from the foul secretions and the inflammation of the fauces, the disinfectant sprays for the fauces recommended above should be perseveringly used. Cool applications around the neck should be at first employed, and the following ointment should be frequently applied:

℞. Plumbi iodidi, ℥j;
Lanolin, ℥j.—M.

If the swelling produced by the adenitis and cellulitis be red from

the intensity of the inflammation, and very painful, suppuration is, according to my observations, inevitable, and a poultice of flaxseed or slippery elm will hasten suppuration and give most relief. But if the swelling be less acute, undergoing little change from day to day, the above ointment, constantly applied upon muslin or linen, will in many cases cause its gradual absorption and disappearance. In subacute cases attended by considerable tumefaction the constant employment of this ointment has, in my practice, produced better results than any other mode of treatment.

Nephritis.—This is a very important and common complication and sequel of scarlet fever. It usually commences in the declining period or during convalescence in mild as well as in severe cases. It is sometimes slight, producing but little aggravation of symptoms, but in other instances it changes the prognosis, causing death in cases which seemed to be favorable prior to its occurrence. The presence of albumin in the urine—which not in all instances, but as a rule, indicates the occurrence of nephritis—is more common in some epidemics than in others. Mr. Thomson[1] states that albumin occurred in 60 per cent. of 180 cases. Microscopical examinations also revealed in most of these cases the presence of casts and blood-cells. Heidenhain found albumin in 80 per cent. of the scarlatinous cases examined by him. On the other hand, Charles West discovered albumin in only 4 per cent. of the patients in one epidemic. It commenced most frequently at the end of the first or in the second week. Atkinson,[2] says in some epidemics albuminuria is present in 70 per cent. of the cases, and in other epidemics not more than 5 per cent, have albuminous urine. He makes the remarkable statement that Jaccoud has not seen a case of scarlatinal nephritis in fifteen years, and that he (Jaccoud) attributes the absence of this complication largely to the use of a milk diet. Certainly, in New York City, so far as my observations extend, in every epidemic of considerable extent a daily examination of the urine after the first few days reveals the presence of albuminuria in some cases, the proportion affected varying in different epidemics.

The *London Lancet*, Nov. 26, 1887, states that the statistics of 3000 cases of scarlet fever admitted into the London institutions showed a death-rate of 7 per cent. Albuminuria in an appreciable quantity and for a considerable time occurred in 15 to 20 per cent. of the cases; 83 scarlet-fever patients died in two of the hospitals, and some form of kidney disease was responsible for this result in 12 per cent. of the deaths.

Anatomical Characters.—Dr. William H. Welch, the pro-

[1] *British Med. Journ.*, Nov. 14, 1885.

[2] *International Journ. of Med. Sci.*, July, 1886.

fessor of pathology in the Johns Hopkins University, in answer to a question of mine, wrote as follows in a note bearing the date of Sept. 16, 1891: "In regard to the renal complications of scarlatina, we have probably to distinguish the moderate transitory albuminuria accompanying the early stages and the height of the disease from the genuine scarlatinal or post-scarlatinal nephritis. The former is probably associated only with such parenchymatous changes as accompany many acute infectious fevers, and is not a genuine nephritis. The latter is in most cases a glomerulo-nephritis, with a varying amount of interstitial change in the form of small-celled infiltration. Whether the genuine scarlatinal glomerulo-nephritis is caused by the specific virus of scarlatina or by some complicating secondary organism is not settled."

Dr. Francis Delafield of New York, who has made many microscopical examinations of inflamed kidneys, says of *acute exudative nephritis* that it sometimes occurs as a complication of scarlatina, as well as of several other diseases, which he enumerates. He states that it has the characters of an exudative inflammation. The liquor sanguinis and the red and white blood-cells escape from the renal vessels into the tubules. "Swelling or necrosis of the renal epithelium and changes in the glomeruli" may also occur. In severe cases resulting fatally "we find the kidneys large and smooth, the cortex thick and white, or white mottled with red, or the entire kidney intensely congested. If the stroma is infiltrated with serum, the kidney is succulent and wet; if the number of pus-cells is very great, there will be little whitish foci in the cortex." The tubal epithelium is sometimes swollen and opaque. Hyaline cylinders identical with the casts are found in the convoluted tubes, and more abundantly in the straight tubes, along with irregular masses formed from the exuded blood-plasma. In the tubes are also red and white blood-cells. The glomeruli exhibit important changes. They become larger and more opaque, "due to the swelling and growth of the cells on and in the capillaries," for the glomerular capillaries in their normal state are covered on their outside by nucleated cells, and flat cells line their inner surfaces in places, not continuously. On account of these cellular changes the individual capillaries in the glomerulus become indistinct, but "the main divisions of the tufts are visible. . . . . In very severe cases the growth of the cells on the tufts is so considerable that they form large masses of cells between the glomerulus and its capsule. The walls of the arteries in the kidneys may be thickened by a swelling of their muscular coats." Acute exudative nephritis may be fatal, even rapidly, but in general those who recover, recover completely. The structural changes enumerated above are more marked in the cortex than in other parts of the kidney.

Acute Diffuse Nephritis.—Dr. Delafield says, in regard to this disease: "It is one of the forms of scarlatinal nephritis. . . . . The kidneys are large, at first smooth, later sometimes a little roughened; the cortical portion is thick, white, or mottled with yellow or red, or congested; the pyramids are red. In these kidneys we find the same lesions as have been described as belonging to exudative nephritis, but with two additional changes—changes which are found in the earliest stages of the inflammation, and which give the characteristic stamp to the lesion: first, a growth of connective tissue in the stroma; second, a growth of the capsule-cells of the glomeruli. These changes do not involve the whole of the kidney, but symmetrical strips or wedges in the cortex which follow the line of the arteries. These wedges are small or large, few or numerous, regular or irregular, in the different kidneys. But in every wedge we find the same general characters: one or more arteries, of which the walls are thickened; glomeruli belonging to these arteries, with a large growth of capsule-cells compressing the tufts; a growth of new connective tissue in the

FIG. 4.

Acute Diffuse Nephritis in Scarlatina (Delafield and Prudden).

a, Swollen capsular epithelium; *b*, proliferation of tuft-cells; *c*, compressed tuft; *d*, swollen stroma infiltrated with cells; *e*, dilated convoluted tubules; *g*, swollen epithelium peeling off; *h*, hyaline casts.

stroma, around and parallel to the arteries. Between the wedges we find at first only the changes of exudative nephritis; later, a diffuse growth of connective tissue. If the nephritis is of acute type and recent, the new tissue between the tubes consists largely of cells; if the nephritis is of subacute type and longer duration, the tissue is

denser and has more basement substance. Where the growth of the new tissue is abundant the tubes become small and atrophied. The exudation from the blood-vessels is very considerable, so that the urine contains large quantities of albumin, many casts, and red and white blood-cells." [1]

The nephritis complicating and following scarlet fever is frequently more dangerous than the primary disease. A clear appreciation of its therapeutic requirements is important, since by judicious treatment many recover who would inevitably be sacrificed by improper measures. The family should be informed that the danger from scarlet fever does not cease with the decline of the eruption, and that the kidneys may become seriously affected when the patient is in other respects fully convalescent. The presence of albumin in the urine, which is readily detected, is commonly believed to be sufficient evidence of the occurrence of nephritis. But we have seen, from the note from which I have quoted, that Professor Welch expresses the opinion that there is an albuminuria of short duration due to slight and transient parenchymatous changes in the kidneys, not nephritis, and the late Professor Austin Flint wrote as follows: "Transient slight albuminuria occurs in scarlet fever, as in various other affections, without denoting renal disease." [2] This transient and slight albuminuria without nephritis occurs during the height of scarlet fever, when the temperature is elevated and the patient is seriously sick in other respects than as regards the urinary apparatus. Owen Fowler, in his remarks on 2000 cases of scarlet fever occurring in four years in the London Fever Hospital, states that albuminuria was sometimes due to the high temperature.[3] The albuminuria which results from acute diffuse nephritis, and indicates its presence, occurs for the most part when the scarlatina is abating or has abated, and it continues as a sequel. Unlike the transient albuminuria alluded to by Professors Welch and Flint, it is attended by the presence of more or fewer blood-cells and casts in the urine.

The cause of scarlatinal nephritis is an interesting subject for investigation. Professor Flint says: "It is an important question whether this sequel proceeds exclusively or chiefly from an agency pertaining intrinsically to scarlatina, or whether it depends on extrinsic causes, such as the action of cold." [4] Mr. Thomson [5] quotes the opinion of Mr. Dickenson, that only a small proportion of the cases of scarlatinal nephritis are due to taking cold. Professor Welch, whom we have already quoted, says that the question is not settled whether the scarlatinal glomerulo-nephritis is "caused by the specific virus of scarlatina

[1] *Handbook of Path. Anat. and Histol.*, Delafield and Prudden, New York, 1889.
[2] *Practice of Medicine*, p. 1055.
[3] *Brit. Med. Journ.*, Nov. 14, 1885.
[4] *Ibid.*, p. 870.
[5] *Loc. cit.*

or by some complicating secondary organism," considering it admitted that it is caused by one or the other; in other words, that it is due to a microbe.

We are prepared, from the consideration of other internal inflammations occurring as complications or sequelæ of scarlet fever, to accept the theory that the cause of the nephritis pertains "intrinsically to scarlet fever" in certain cases, and that in these cases it is microbic. We have seen that bacteriologists have discovered microbes, the streptococci predominating, at the seat of inflammation in the otitis, arthritis, pleuritis, pneumonia, pericarditis, and endocarditis complicating scarlet fever. Moreover, we have stated elsewhere that in 13 of 14 cases of albuminuria and œdema occurring in scarlatinal nephritis, it is reported that Babes found the streptococcus either alone or associated with the pneumococcus of Talamon-Fränkel in the kidneys. Nevertheless, it is well known that nearly all writers on nephritis occurring independently of scarlet fever regard taking cold as the most important factor in producing it, and from the observation, extending through many years, of cases of scarlatinal nephritis, it has seemed to me that those who are in bed or in a warm room until the acute symptoms have abated, and are carefully housed or warmly clothed during the period of desquamation, are more likely to escape the nephritis than are those who are early and carelessly exposed to currents of air or outdoor weather. Moreover, as I have had opportunities to observe, the mildest cases of scarlet fever, in which the system is so slightly affected that the presumption is strong that the kidneys cannot be injured by the direct action of the poison or by microbic agency, nevertheless are liable to contract nephritis if early and injudiciously exposed to outdoor weather. Thus I recall to mind a case of severe scarlatinal nephritis which occurred in the favorable season of midsummer, and was nearly fatal from eclampsia. The parents at first said that the child had not had scarlet fever, but finally said that it had had a rash two weeks previously, which they supposed was due to the summer heat, and during the continuance of which it played every day in the open air. The frequency of nephritis after very mild attacks of scarlet fever has, I think, been correctly attributed to the fact that such cases are carelessly treated as regards exposure to the weather.

What are we to infer from these facts? It seems to me that in many cases, especially in those of a severe type, the glomerulo-nephritis is caused by the action of microbes, and that the proofs of this are sufficient, as we have elsewhere stated, to justify, as a means of preventing the renal inflammation, the frequent disinfection by non-irritating but efficient antiseptic sprays or irrigation of the nasal, post-nasal, and faucial surfaces from the earliest possible moment. I need not here repeat what I have stated elsewhere in regard to the kind of antiseptic which

will probably be most serviceable, for the same antiseptic treatment which we rely on for preventing the superficial inflammations, as the adenitis and cellulitis, will probably be successful in preventing the more serious and deeper-seated renal inflammation if the theory of the microbic origin of the latter be correct, even if the nephritis have commenced. I must state my belief that disinfection of the nasal, post-nasal, and pharyngeal surfaces should be employed daily as long as they exhibit the inflammatory appearance.

But since clinical observations justify the belief that exposure to cold causes the nephritis in certain cases, as it is known to cause nephritis occurring independently of scarlet fever, the patient should be kept in bed during the scarlet fever, however mild it may be, and in a comfortable and warm temperature during the three or four weeks of desquamation. The physician should never discharge a scarlatinous patient, although his health is apparently entirely restored, without one or more examinations of his urine at his last visits. When his visits cease the nurse should be instructed to make the examinations by heat and nitric acid twice weekly during the ensuing month, and if any evidence, however slight, appear that the kidneys are involved, the physician should be notified, in order that appropriate treatment may be immediately commenced. Early and correct treatment of the nephritis is attended by much better results than delayed treatment, and many more patients are doubtless now saved than in former times, when little attention was given to the state of the kidneys until dropsy or other prominent symptoms appeared. I have found no mother or nurse so ignorant that she could not properly employ the tests of nitric acid and heat; and if she be solicitous for the welfare of the child, she will not hesitate to carry out the directions, and notify the physician if the tests employed produce the least cloudiness or turbidity of the urine.

The patient, as soon as nephritis begins, should be put to bed in a room of warm and equable temperature (72° F. to 75° F.). His diet should be liquid, consisting of milk, farinaceous food, and a moderate quantity of animal broths. He may drink liquids freely, especially water not too cool, to which spiritus ætheris nitrosi is added. If there be marked prostration from the primary disease, alcoholic stimulants should be allowed.

The indications of treatment are to relieve the hyperæmic kidneys by diaphoresis and purgation, and when this is effected to increase the quantity of urine, which is usually diminished, and thus eliminate that poisonous product, urea, which is the chief noxious principle generated in the system in this disease. To produce diaphoresis the patient should be immersed in a warm bath at about the temperature of the body (98° to 100°), in which, if he be quiet and comfortable, he should

remain from fifteen to twenty minutes, but a shorter time if restless and frightened by the water; after which he should be placed in a warm bed and well covered by blankets. If perspiration result, the bath has been useful, and it may be employed in grave cases two or three times daily. If perspiration do not result, it may be produced by surrounding the body by hot air, either dry or moist. Hot air may be produced by burning alcohol in a thin layer upon a plate under a chair upon which the patient sits surrounded by a blanket, or he may be covered in bed and the hot air introduced under the bed-clothes. In New York City a convenient apparatus is used for this purpose, consisting of a small sheet-iron pipe enclosed in a small box of the same material. The box is in the form of a trunk, with a handle for convenience in carrying, and the lower end of the pipe, which extends nearly to the floor, contains an alcohol lamp. Hot moist air may be produced by placing bottles of hot water surrounded by towels wrung out of water against the body and limbs of the patient, who is suitably covered in bed. The steam arising from them and enveloping the body and limbs produces a prompt sudorific effect. There is in use in New York City a convenient apparatus for generating steam in the treatment of these and other cases requiring diaphoresis. It consists of a cylinder pierced with holes for the admission of air, and containing a spirit lamp, over which is a pan or pail holding a little water. The patient, nearly denuded, is placed in a chair with the apparatus underneath, and is covered by a blanket, so that the steam surrounds the body. This gives rise to free perspiration, which continues after the patient is placed in bed. By means similar to the foregoing a sufficient sudorific effect can usually be produced.

The sudorific effect of the treatment by external warmth described above should be aided by the use of diaphoretics. Those which have been most prescribed are the liquor ammonii acetatis, the acetate of potassium, the bitartrate of potassium, the citrate of potassium, and the spiritus ætheris nitrosi. If employed when the surface is cool, these medicines act rather as diuretics than diaphoretics. Being simple in their action and without deleterious effect, they may be given frequently and in large proportionate doses for the age. The following will be found a useful mixture having diaphoretic, diuretic, and laxative properties:

℞. Potassii acetatis,
Potassii bicarbonatis,
Potassii citratis, āā. ʒij;
Infus. tritici repentis, ʒviij.—M.

Dose. Give one tea-spoonful every three or four hours to a child of five years.

But during the last few years a diaphoretic has been discovered and employed which surpasses those previously prescribed in power and efficiency, and which in cases of unusual gravity, when other remedies have failed, is, I believe, sometimes instrumental in saving life. I refer to pilocarpine, the active principle of jaborandi. Being soluble in water and tasteless, it is easily administered, and is retained when, on account of the uræmic poisoning present, the stomach is irritable, and medicines that are unpleasant to the taste are liable to be vomited. The alcoholic stimulant may be increased at the time of its use, in order to guard against any depressing effect. To a child of two years from $\frac{1}{40}$ to $\frac{1}{20}$ of a grain may be given every six hours or every four hours, by the mouth. It may be employed hypodermically—$\frac{1}{20}$ of a grain to a child of five years. It has both a diuretic and a diaphoretic action, and it stimulates both the salivary and mucous secretions. According to one observer, an adult when fully under the influence of pilocarpine secretes from one to two pints of saliva in two hours, and Leyden reports a case of diphtheritic nephritis in which the quantity of urine rose from half a pint to five pints daily. But its most prompt and certain action is on the sweat-glands. Hirschfelder speaks of its beneficial action in relieving various forms of dropsy, and adds: "In one morbid condition of the kidney, however, jaborandi is the remedy *par excellence*, and that is the acute parenchymatous nephritis which frequently follows scarlet fever. . . . . This disease heals spontaneously if the danger which threatens life from the reduction of urine, and from the effusion of fluid into the cavities of the body, be averted. In this disease jaborandi works wonders." I have also found it an invaluable agent when the older remedies failed and death seemed imminent. The following cases, in which the beneficial action of this agent was apparent, occurred in my practice:

Case 1.—G——, male, aged five years and six months, sickened with scarlet fever June 2, 1882. The case progressed favorably, and during the convalescence my attendance ceased. On June 24th my attention was again called to the child, when the urine was found to be scanty and very albuminous. The common treatment was employed —to wit, warm baths, derivatives over the kidneys, laxative doses of jalap, and the potassium bitartrate. The urine, however, remained scanty—2 ounces in twenty-four hours—and on June 28th severe convulsions occurred, which were controlled by doses of bromide of potassium and 5-grain clysters of chloral. The muriate of pilocarpine was now given in doses of $\frac{1}{32}$ of a grain every three hours in cold water. This was not vomited, and it must have been given in larger doses than that directed, for on July 1 the bottle, containing one grain, was empty. The mother stated that the child had taken only two doses, or $\frac{1}{16}$ of a grain, of the pilocarpine, when both the diuretic

and diaphoretic effects were apparent. The mother also stated that the quantity of urine was larger when the pilocarpine was administered every third hour than when given at a longer interval. A flaxseed poultice dusted with mustard was also applied over the kidneys. Occasional convulsive attacks continued to occur, which were readily controlled by enemata of chloral. On June 30th all the symptoms were better: no more attacks of eclampsia had occurred, and the urine was more abundant and less albuminous. The mother remarked that the new medicine had settled the stomach and increased the urine. The record for July 4th states: "Continues to improve; takes the muriate of pilocarpine, $\frac{1}{32}$ grain, every six hours, and has not vomited since he began to take it; pulse 106, temperature 99°; is playful; passes urine freely, and takes nearly three quarts of milk daily, with some farinaceous food. July 6th, is fully convalescent; pulse 92, temperature 99°; perspires much; urination normal in quantity and character."

Case 2.—Mary S——, aged five years, was exposed to her brother who had scarlet fever, and about the same time she had sore throat without any efflorescence. Nearly two weeks subsequently (Dec. 22, 1882) she had the symptoms of severe nephritis; her urine was reduced to 4 ounces in twenty-four hours, and was highly albuminous. A powder of calomel 3 grains and of resin podophyllin $\frac{1}{6}$ grain was prescribed, and it produced one stool. One-twentieth of a grain of muriate of pilocarpine administered was vomited, but another dose was taken at 10 P. M., and the mother says that the patient "sweat fearfully" during the night. Three or four doses were administered daily during the following week, and when not vomited they usually produced perspiration lasting from one to one and a half hours. The record for Dec. 30th is as follows: "Takes $\frac{1}{20}$ grain pilocarpine twice daily, and occasional doses of infusion of digitalis; urine more abundant, its specific gravity 1014, slightly albuminous, and containing very few granular casts and blood-corpuscles; has lost its smoky appearance; reaction alkaline; perspiration slight; patient convalescent."

Other similar cases might be related, sufficient, I think, to show that pilocarpine given, as in the above cases, in moderate doses and with sufficient interval, does not produce any deleterious effect, and is a very useful remedy in scarlatinous nephritis. It is a remedy, however, that should be given cautiously, at sufficiently long intervals, and discontinued when the urgent symptoms are relieved. I have seen in one instance fatal bronchorrhœa rapidly develop in a child that had taken this medicine in too large or too frequent doses.

In the treatment of scarlatinous nephritis laxatives or purgatives of a hydragogue nature are very beneficial, especially when dropsy occurs or symptoms indicating uræmic poisoning are present. Their

action is more certain than that of most diaphoretics and diuretics, and their employment is imperatively required in severe or dangerous cases, in which it is necessary to remove as soon as possible the serum or urea which endangers life. Young children, or those with delicate stomachs and those much enfeebled by the primary disease, may take magnesia, either the citrate or the calcined. A good cathartic for ordinary cases is a mixture of jalap and potassium bitartrate, the pulvis jalapæ compositus, consisting of one part of jalap and two of cream of tartar. Ten grains of the mixture may be given to a child of five years, and repeated in from two to four hours, according to circumstances. Its effect is increased by dissolving a tea-spoonful of potassium bitartrate in a gobletful or half a gobletful of water, and allowing the patient to drink from it. The following cathartic also acts promptly and beneficially in the treatment of scarlatinal nephritis:

℞. Olei cinnamomi, gtt. viij;
Magnesii sulphat. ℥j;
Potassii bitartrat., ℥ij.—M.
Sig. One tea-spoonful repeated at intervals of from two to four hours until catharsis occurs.

After the use of laxative agents, the kidneys, being less congested on account of the diversion that has occurred, often begin to excrete urine more freely. But if the patient be anæmic or enfeebled, and the symptoms due to the nephritis be not urgent, it is frequently better to avoid active catharsis, which reduces the strength more or less, and employ remedies of a sustaining character, as in the following case, which occurred in my practice: A little boy, pallid and scrofulous, began to have anasarca after scarlet fever, chiefly in the scrotum, with a moderate degree of ascites. The urine, which was passed in nearly the normal quantity, contained albumin, but not in large amount. The patient gradually and fully recovered with no treatment except the use of iron internally and the application of an oil-silk jacket over the kidneys and abdomen to produce diaphoresis. Such a patient, treated by the powerful eliminatives which we employ for the more urgent and robust cases, would probably have been injured rather than benefited. No treatment can therefore be recommended for scarlatinal nephritis which will be strictly applicable to all cases. Variations are demanded according to the state of the patient and the form and gravity of the disease.

Diuretics which do not stimulate the kidneys are proper at an early as well as late period of the renal malady, and digitalis is the one usually prescribed. I do not hesitate to order it from the first day in combination with acetate of potassium. One tea-spoonful of the

infusion may be given every third hour to a child of five years. The following formula is for one of this age in good general condition:

℞. Potassii acetatis, ℥ss;
Infus. digitalis, f℥vj.—M.

Local treatment should also be prescribed, since it furnishes important aid in subduing the nephritis. Thomas, Romberg, and others have recommended the application of leeches over the kidneys. Thomas says: "In many cases the abstraction of blood causes immediate and permanent relief; the fever and the pain in the region of the kidneys cease, the secretion of urine becomes augmented, the albuminuria lessens from day to day, and the moderate degree of dropsy that has been developed disappears." Abstraction of blood by leeches or otherwise I have never employed, and it is likely, in my opinion, to do harm rather than good, unless, perchance, it may be of service in exceptional instances in robust children who have not been perceptibly reduced by the primary disease. In the majority of cases, instead of depletion, a poultice, slightly irritating, between two pieces of muslin, should be constantly worn over the kidneys as long as the albuminuria or nephritic symptoms are pronounced. A poultice of equal parts of pulverized flaxseed and ginger, or of 1 part of pulverized mustard and 16 of flaxseed, mixed with sufficient water to moisten thoroughly the cloth which retains it, is the best for this purpose. Older children, not likely to be frightened by the process, may be treated by the daily application of dry cups over the kidneys while the body is warmly covered. In subacute cases, not attended by any alarming symptoms, sufficient redness may be produced over the kidneys by any one of the well-known mildly irritating plasters constantly worn.

Eclampsia is another not infrequent complication in scarlet fever. It is caused during the first stages or in the active period of scarlet fever by the irritating action of the scarlatinous poison upon the nerve-centres; but, occurring at an advanced stage of the disease or in the declining period, it is in most instances caused by the retained urea. The same remedies are required to control the convulsive movements as when they occur under other circumstances. The bromide of potassium or sodium should immediately be administered in large and frequent doses whenever eclamptic symptoms arise. During an attack of eclampsia a child of three years should take 5 grains of either of these agents every five to ten minutes until the convulsive movement ceases, and then at longer intervals. Chloral is a more powerful agent, and if the eclampsia be not quickly controlled, I commonly

employ it *per rectum*, dissolved in one or two tea-spoonfuls of water. For a child of three to five years, 5 grains should be thrown into the rectum by a small glass or gutta-percha syringe, and retained by pressure. Properly administered and retained, it rarely fails to control the eclampsia within ten or fifteen minutes. Subsequently, occasional doses of the bromide should be given to prevent the recurrence of eclampsia, while measures are being employed to diminish the severity of the scarlet fever and perhaps to eliminate the urea.

Inflammation of the joints, believed to be in most instances rheumatic, but in some instances, perhaps, having an origin different from rheumatism, endocarditis, and pericarditis, arising as complications or sequelæ, require the treatment which is appropriate when they occur under other circumstances; but the remedies should not be depressing, as the system is already enfeebled by the primary disease. The rheumatic nature of the affection of the joints is rendered probable by the fact that it is in some patients immediately followed or complicated by endocardial or pericardial inflammation, like idiopathic rheumatism. If the arthritic affection be mild, it commonly abates in a few days, even without medication, with some soothing lotion and support. The following liniment may be applied upon muslin and covered by cotton wadding:

℞.	Acidi carbolici,	f℥j;
	Tinct. belladonnæ,	f℥j;
	Ol. camphorati,	f℥ij.—M.

If the arthritic inflammation be severe and occur in several joints, it may increase the fever and suffering of the patient. Under such circumstances doses of the sodium salicylate, as in idiopathic rheumatism, have a beneficial effect, reducing the fever, inflammation, and suffering. In severe cases an occasional opiate alleviates the pain and gives sleep.

Endocarditis and *pericarditis* require rest in the horizontal position, avoidance of all excitement, and, if the pulse be frequent and weak, a dose of digitalis or digitalis and strophanthus at regular intervals, as every third hour. I prefer the following combination:

℞.	Tinct. strophanthi,	f℥ss;
	Tinct. digitalis,	f℥j.—M.

Dose, 4 drops every three or four hours to a child of five years.

The same external treatment is required as in acute pleurisy. I prescribe the application of a thin poultice of flaxseed containing $\frac{1}{16}$ part of mustard and covered with oiled silk. The cardiac inflammations

often require the use of a bromide in sufficient dose to procure quiet and sleep, aided perhaps by paregoric, which does not weaken the heart's action, but rather strengthens it on account of the alcohol and camphor which it contains. The physician should enjoin a quiet life and freedom from excitement for weeks after the signs of endocarditis or pericarditis have abated.

Pleuritis, which is one of the most dangerous and protracted sequelæ of scarlet fever, and which is very likely to be suppurative, demands the same treatment as when it occurs in cachectic patients.

MEASLES.

In order to employ the proper prophylactic and therapeutic measures for the prevention and cure of a disease, its cause and nature should be ascertained. It is the universal belief that measles is a microbic disease. Micrococci were found in the blood of rubeolar patients by Coze and Feltz. Keating also discovered them during an epidemic of malignant measles,[1] and Ransome, Braidwood, and Vacher found them in the breath of patients as well as in their tissues.[2] Whether the causal agent be a coccus or some other microbe, the incubative period, though probably varying in different cases, appears to be on the average about nine days from the time of exposure until the commencement of the first symptoms, or twelve to fourteen days from the time of exposure until the commencement of the eruption.

Prophylaxis.

Measles seems to be contagious as soon as the first symptoms appear; that is, three or four days before the eruptive stage. It is contagious during the eruptive stage, and how long afterward has not been clearly ascertained. It is communicated by the breath of the patient, and probably by exhalations from his surface. It has been inoculated by the serum from vesicles which sometimes occur in connection with the rubeolous eruption, and also by the blood of a patient. Inoculation does not seem to render the disease milder, and as measles, when contracted in the ordinary way, is not in itself dangerous, but dangerous only from complications, inoculation is not performed except as a matter of scientific interest. The communication of measles is believed to be in all cases directly from the patient. The specific germ, unlike that of scarlet fever and diphtheria, but like that of pertussis, does not adhere to objects handled by the patient or in his immediate vicinity; nor does it adhere to the clothes, bedding, furniture, or walls

[1] *Phila. Med. Times*, Aug. 12, 1882. [2] *Brit. Med. Journ.*, Jan. 21, 1882.

of the apartment occupied by the patient. Some instances have been related in which it was stated that it was communicated by a third person; but it seems probable, from the nature of the disease, that these observations were fallacious, and perhaps a mistake was made in the diagnosis. The specific principle is, therefore, so volatile, so slightly adherent to objects, that domiciliary disinfection is not required after the termination of a case. Open doors and windows, complete renewal of the air of the apartment occupied by the patient, airing of his clothes and bedding, and the washing in boiling water of such articles as are worn next his body or have been in contact with his surface, are sufficient precautionary measures to prevent the spread of the disease as regards the management of the sick-room and the articles which it contains.

But, while these statements are correct, nevertheless measles is so highly contagious that it is much more difficult to prevent its propagation when it is introduced into a family, school, or asylum than in the case of diphtheria or scarlet fever. The specific principle of measles is so volatile, and its area of contagiousness extends so far, that the most rigid quarantining of the patient at a distance from healthy children is necessary to prevent its propagation.

Treatment.

Uncomplicated measles requires little medicinal treatment except to palliate symptoms. The child should be kept in an airy apartment, at a uniform temperature of about 70°. The room should be darkened by lowered curtains and the exclusion of bright lights, since a bright light is painful to the patient on account of the conjunctivitis which accompanies the disease. Moist air in the room is also preferable to dry air. While the popular idea is erroneous that the patient should be kept in a heated atmosphere, it is correct that currents of air and sudden reductions of temperature are dangerous. A violent and fatal attack of croup occurred in my practice in a girl of fifteen years, apparently in consequence of exposure at an open window at the close of the eruptive stage. The patient should be kept in bed, constantly covered, from the time that the diagnosis is made until not only the eruption, but the fever, has disappeared. He should remain in the room, comfortably warm (70°) and free from draughts of air, until the cough ceases.

These precautionary measures, designed to prevent complications, are important. Several years ago the only child of a well-known New York family, a girl aged five years, when thickly covered with the rubeolar eruption, was allowed to sit with its parents at the dinner-table, and when helping herself to a drink the rash suddenly disappeared, and severe eclampsia occurred, ending in a few hours in coma and death. The case was promptly treated by Dr. John L. Campbell

and myself, but without apparently retarding the fatal progress of the attack. There can be little doubt that the case would have progressed favorably, and the child would now be alive, if she had remained warm and quiet in bed during the progress of the measles.

Intelligent parents, with the best intentions and devoted to the welfare of their children, frequently err in regarding measles as a trivial disease. Epidemics of it do not occur in any of the institutions with which I have an official connection without causing a greater or less mortality, and mainly from inflammatory complications. During the two or three weeks succeeding an attack care should be taken to avoid exposure to cold or to sudden changes of temperature, since there is great liability to inflammation of the mucous surfaces until the health is fully restored.

The diet in measles should be mild, and for the most part liquid. The patient, indeed, refuses solid food, but on account of the thirst takes liquids more readily. Farinaceous substances, with milk, afford sufficient nutriment in ordinary cases. If the previous health have been poor and the vital powers reduced, or if there be a complication, more sustaining diet is required. Stimulation by wine or brandy is needed in these cases.

The cough ordinarily requires treatment, inasmuch as the suffering of the child and loss of sleep are largely due to this symptom. Demulcent drinks, as flaxseed tea, infusion of slippery-elm bark, or the solution of gum arabic, are useful, to which, to render them more palatable, lemon-juice may be added. A small dose of Dover's powder or the mistura glycyrrhizæ composita of the U. S. Pharmacopœia, or, what I frequently prescribe, the *Syrupus contré la toux* of the French Pharmacopœia, relieves the severity and diminishes the frequency of the cough.

Since one of the most common and dangerous complications of measles is inflammation of the respiratory organs, local treatment directed to the chest is important if the bronchitis have more than the ordinary severity and the cough be frequent and painful. The chest under such circumstances should be covered by cotton wadding or thick flannel, over which, in cold weather, it may be best to apply oiled silk. Such applications increase the amount of eruption underneath, and a copious eruption tends to prevent the occurrence of capillary bronchitis and pneumonia. If the eruption be tardy in its appearance or indistinct, it is well to produce moderate counter-irritation over the chest by some gentle irritant upon the surface, as camphorated oil, to which in the older children one-fifth or one-sixth part of turpentine may be added, or the oleum caryophylli, 1 drachm, to oleum camphorati, 2 ounces, may be employed.

Bronchitis so severe as to be properly regarded as a complication, and

pneumonia, which commonly occurs from the extension of the inflammation from the bronchial tubes into the alveoli, may, if occurring in the first stage of measles, prevent the full and normal development of the eruption, or if occurring during the eruption they may cause its disappearance. Prompt counter-irritation over the chest, but not so severe as to vesicate or make the patient restless, is required in the treatment of these inflammations. Trousseau states that he has derived benefit in the treatment of bronchial and pulmonary inflammations from what he designates urtication. This is produced by stroking the chest two or three times daily with the nettle (*Urtica dioica* or *Urtica urens*). This causes a prompt and abundant eruption, and with a less amount of suffering than one would suppose. The fever abates, and the respiration becomes more natural in proportion to the amount of nettle-rash. On the second day the effect is less than on the first, and after three or four days, says Trousseau, no further irritation results from the nettle. A more convenient and, in my opinion, preferable local treatment is the application over the chest, anteriorly, laterally, and posteriorly, of a light and thin poultice of equal parts of pulverized ginger and flaxseed, or of 1 part of mustard to 16 of flaxseed, between two pieces of muslin, made so moist that it wets the hands in holding, and covered by oiled silk or muslin. Derivatives to the extremities are also of some use in these cases.

Severe bronchitis and pneumonia occurring in measles require stimulating expectorants, the best of which is ammonium carbonate. I frequently write the following prescription, which is useful both as an expectorant and a cardiac stimulant. Given in milk or after food is taken, it does not cause gastritis, as it sometimes does in young children when employed in too concentrated a form. The dose of ammonium carbonate should be 1 grain at the age of one to two years, and 2 grains between the ages of three to five years:

℞. Ammonii carbonat., gr. xvj to ʒss;
Aquæ puræ, f ʒij.—M.

Sig. Give one tea-spoonful in four or five tea-spoonfuls of milk every hour or two.

The chloride of ammonium, in double the dose of the carbonate, is sometimes employed with apparent benefit in these cases. Quinine to reduce the fever, and digitalis, strophanthus, or camphor as a heart tonic, are also very useful in these inflammations.

Any intercurrent disease complicating measles requires for the most part such treatment as is appropriate when it is idiopathic, but secondary diseases require sustaining measures more than primary. As a rule, the patient should be in bed during the complication, although it may continue days or weeks beyond the normal period of measles.

Constipation should be relieved by simple warm enemata of water containing a little soap, or sweet oil and castor oil. Irritating purgatives should never be employed, since they are likely to cause recession of the eruption, and, especially in warm weather, intestinal catarrh. Eclampsia seldom occurs if the child be warm and in bed. It is less dangerous in the commencement of measles than subsequently, for, occurring during or immediately after the eruptive stage, it probably indicates the beginning of some complication. The premonitions of eclampsia, such as restlessness, delirium, and sudden starting or twitching of the limbs, and eclampsia itself, should be promptly treated by large and frequent doses of bromide of potassium or sodium, or, if this treatment be not adequate, by sufficient doses or enemata of chloral. The importance of prompt and effectual treatment of this complication is apparent from the fact that it is sometimes fatal, as in the case related above. A foot-bath of warm water to which mustard is added, or, if the eruption recedes or is slow in appearing, a general warm bath, should also be employed in cases of eclampsia or when symptoms occur premonitory of eclampsia. Also in such cases it is proper to apply cold to the head, as a large silk or linen handkerchief frequently wrung out of ice-water to which a little vinegar or alcohol is added.

Epistaxis occasionally occurs, and within certain limits it may be useful, relieving headache, delirium, and cerebral congestion if these be present. But when protracted or profuse it should be arrested by plugging or compressing the nares or by the use of astringent injections. Endocarditis and pericarditis rarely occur in measles, but in measles in debilitated patients thromboses of the small vessels are more common than in any other infectious disease, producing patches of gangrene of the skin and subcutaneous tissue. At least good observers have attributed the gangrene which sometimes occurs in the vulva, distal portions of the limbs, and in the cheeks and gums (noma or cancrum oris) in cachectic cases of measles to the plugging of the vessels by thrombi. Rilliet and Barthez have published a table of 98 cases in which gangrene resulted from various diseases. In 49 of these the antecedent disease was measles, in 5 scarlet fever, 6 whooping cough, 9 intermittent fever, 9 typhoid fever, 7 mercurial salivation, and 5 enteritis. In 46 cases collected by MM. Bouley and Caillault the antecedent disease was measles in all but 5.

Since gangrene occurring in measles is eminently a disease of debility, all antihygienic influences should be removed and the most nutritious diet with tonics should be prescribed. The ferruginous preparations and bitter tonics are useful. The physician should endeavor to arrest the gangrene, accelerate detachment of the slough, and produce a healthy and granulating state of the surrounding tissues.

This is best effected by applying a highly stimulating, or even escharotic, agent to the inflamed surface underneath and around the gangrene. A large number of stimulating and escharotic substances have been employed in cancrum oris.

In the treatment of gangrene occurring elsewhere than in the cheeks, lips, gums, and adjacent parts—that is, in the extremities, genitals, neck, ears, or upon the trunk—it is perhaps best to incise and remove the gangrenous part with scissors, so far as possible without causing hæmorrhage, and dust the parts thoroughly with iodoform, or its modified form, aristol.

In the treatment of cancrum oris, or gangrene of the mouth—terms which are also applied to gangrene of the cheeks and gums when it extends to these parts—M. Taupin recommends, after removing a considerable part of the gangrenous substance with scissors or other instrument, the application of strong muriatic acid, and, when the slough is detached, of dry chloride of lime. Rilliet and Barthez advise the use twice daily of muriatic acid or the acid nitrate of mercury—a powerful and dangerous remedy unless largely diluted with water. Whatever agent is used, they recommend its application by a brush upon and around the slough, followed immediately afterward by the application of the dry chloride of lime, which neutralizes the acid. The gangrenous and adjacent parts are then thoroughly washed with water from a syringe. They also direct frequent ablution with water in the intervals of this treatment. After the slough has separated the escharotic is to be discontinued and the chloride of lime used alone. Dr. Charles West has also employed muriatic acid. He says: "In one of the cases that I saw recover the arrest of the disease appeared to be entirely owing to this agent, though the alveolar processes of the left side of the lower jaw, from the first molar tooth backward, died and exfoliated, apparently from having been destroyed by the acid."

In 1881 an epidemic of measles occurred in the New York Foundling Asylum during the attendance of Drs. O'Dwyer and Lee. The number of children affected with it was 165, and, since many of them were cachectic, we were not surprised that gangrene appeared as a complication or sequel in 7 cases. In a girl of three and a half years it occurred upon the upper jaw around the roots of the teeth; in two girls of four years it occurred upon the inside of the cheek and upon the vulva, but not upon the gums; in a boy of three years it attacked the lower jaw, destroying four teeth with their sockets, and the upper jaw, destroying five teeth with the corresponding portion of the maxillary bone, so that all the incisors and one canine were lost, as well as the cartilaginous portion of the nasal septum. Gangrene also occurred in the groin in this case. Another boy, of three and a half years, lost two incisors from gangrene of the jaw. The treatment by muriatic

acid was employed in these cases, and, according to the house physician, Dr. Kortright, there was no further extension of the gangrene in any of them after the first application of the acid. These 5 patients lived, except the first, who had broncho-pneumonia. The remaining 2 children, both of the age of four years, died of diphtheria and pneumonia before the treatment for the gangrene could be tested. One of them had commencing gangrene of the lower jaw, and the other of the soft palate. Since this epidemic in the Foundling Asylum carbolic acid has been employed as an escharotic in one or two cases in this institution, instead of muriatic acid, and with such a result as to encourage its further use as an escharotic and stimulant in gangrene.

The purpose in employing a strong escharotic, as undiluted muriatic acid or one of its equivalents, is to establish a healthier state of the tissues. It cauterizes and destroys whatever soft tissue it comes in contact with; but at the same time, unless carefully used, and sometimes with precautions, it exerts a strongly corrosive action on the teeth and jawbone. Therefore in gangrene affecting the jaw there is great danger that it will destroy the periosteum, and consequently increase the necrosis.

A safer, less painful, and in many cases successful treatment is that employed by many British and American physicians—namely, the use of escharotics diluted, or, if applied in their full strength, such as are least active and penetrating. Some employ from the first topical treatment which is astringent and stimulating, rather than escharotic, and they report satisfactory results. Dr. Gerhard believes that "the best local application is the nitrate of silver if the slough be small in extent; if much larger, the best escharotic is the muriated tincture of iron, applied in the undiluted state. After the progress of the disease is arrested the ulcer will improve rapidly under an astringent stimulant, such as the tincture of myrrh or the aromatic wine of the French Pharmacopœia."

The local treatment recommended by Evanson and Maunsell differs from that advised by any of the writers from whom I have quoted. A knowledge of this treatment, from which I myself have seen good results, will be best imparted by quoting from these authors: "The lotion which we have found by far the most successful is a solution of sulphate of copper, as employed by Coates in the Children's Asylum. His formula is as follows:

℞. Cupri sulphatis,	ʒij;
Pulv. cinchonæ,	℥ss;
Aquæ,	fʒiv.—M.

This is to be applied twice a day very carefully to the full extent of the ulcerations and excoriations.

The cinchona is only useful by retaining the sulphate of copper longer in contact with the edges of the gums. A solution of the sulphate of zinc, 1 drachm to 1 ounce of water, by itself or combined with tincture of myrrh, Dr. Coates found to be also useful in some cases.

A moment's reflection will show us that the foregoing treatment is preferable, provided that it is equally effectual in arresting the gangrene, to the treatment by the strong acids which are in common use, and the efficiency of which cannot be questioned. If, after employing the milder treatment two or three days, the gangrene continue to spread, strong muriatic acid, carbolic acid, or one of their equivalents should be cautiously applied by a glass rod or tube in such a way that it comes in contact with only the diseased surface. It should be immediately followed by an alkaline wash, such as a solution of sodium bicarbonate.

The gases arising from the gangrenous mass are not only highly offensive to others, but they are doubtless injurious to the patient, who is constantly inhaling them. To remove the fœtor a non-irritating and harmless disinfectant should be frequently employed between the applications of the powerful agent designed to check the extension of the gangrene. Spraying the affected surface with Labarraque's solution 1 part to 10 of water, corrosive sublimate 2 grains to 1 pint of water, carbolic acid 1 drachm to ½ a pint of water, or peroxide of hydrogen 1 part to 4 of water, is useful for this purpose. When the gangrene is removed and the granulations present a healthy appearance, the danger as regards the gangrene is past and convalescence is established. Then no energetic topical treatment is required. A mild, stimulating lotion, like the tincture of myrrh, as recommended by Dr. Gerhard, suffices, with the aid of tonics and nutritious diet.

In rare instances measles presents a severe and dangerous form from its commencement, being attended by a profound alteration of the blood, so that either hæmorrhages occur or the coloring matter of the blood (hæmatin) is effused under the skin. This type of measles has been designated malignant. Its symptoms from the beginning indicate a profound dyscrasia and prostration. The pulse is rapid and weak; the patient is delirious or anxious and restless or somnolent; the internal temperature is unusually elevated, although the extremities may be cool. The eruption has a dusky livid color, and as it fades in favorable cases, it leaves yellowish stains from the effused coloring matter of the blood, which is slowly absorbed. Keating has apparently demonstrated the abundant formation of micrococci in the blood in malignant measles. This form of measles requires for the most part the treatment which is appropriate for severe scarlet fever or diphtheria, but is very fatal under even the best treatment. The

inflamed surfaces should be sprayed every hour with peroxide of hydrogen, 1 part to 4 of water, so as to destroy all the microbes which abound upon these surfaces and in the muco-pus. The alcoholic preparations should be given freely, as one tea-spoonful of whiskey or brandy in milk every two hours or oftener. Iron is needed to improve the quality of the blood, and of the different ferruginous medicines perhaps the tincture of the chloride of iron acts as promptly and efficiently as any other. It should be given in hourly doses. If further observations confirm those of Keating, and the fact be admitted that microbes occur in the blood and tissues in malignant measles, whether they are to be regarded as a cause or effect of the disease, perhaps corrosive sublimate administered internally may be found useful, as it is believed to be in diphtheria, in consequence of its germicidal action. Nasal catarrh and otitis so severe as to require special treatment are not so common in measles as in scarlet fever. Schwartze says that 3 per cent. of the cases of otitis occurring in children originate from measles. Both the nasal and aural inflammations require the same treatment as when they occur in scarlet fever, and which has been detailed in the preceding pages.

RÖTHELN.

I HAVE made a careful study of all the cases of rötheln which have come to my notice since 1873. Hardaway, in his article on rötheln published in 1884, says: "American physicians were almost entirely ignorant of rötheln till within the last ten years, when they were made acquainted with it through the medium of a careful paper on the subject from the pen of J. Lewis Smith of New York." The paper alluded to was published in the *Archives of Dermatology*, Oct., 1874. Since as well as during the epidemic which furnished the material for this paper, I have recorded the history of cases when opportunity occurred, and my observations enable me to state that rötheln in itself is not fatal, and is even trivial if we estimate its importance by the danger or injury to the system which it produces. Nevertheless, complications sometimes occur which may be dangerous, and even fatal, and which therefore require prompt treatment. The complicating diseases which have been observed are quite numerous, among which we may mention bronchitis, pneumonia, pleurisy, enteritis, entero-colitis, colitis, icterus, stomatitis, rheumatism, meningitis, abscesses, miliaria, pemphigus, erysipelas, œdema, enlargement of the thyroid, otorrhœa, earache, and keratitis. The complications, therefore, so far as the comfort and safety of the patient are concerned, are much more

important than the primary disease. They require the same treatment which is proper when they occur under other circumstances.

If the temperature in uncomplicated rötheln reach 103°, and the patient be restless, 1 grain of phenacetin with 4 or 5 grains of bromide of potassium or sodium may be properly given every three hours to a child of three years, until the fever and restlessness abate. If fever sufficient to require treatment continue beyond the third day, it is probable that it is due to some complication which will be revealed by examination. Restlessness without marked elevation of temperature requires only the use of the bromide. Uncomplicated rötheln terminates so soon that it seldom causes any appreciable impairment of the general health. Still, in cities so many cases have poor appetite and are anæmic that tonics containing iron are often useful after the physician discontinues his attendance.

VARICELLA.

Varicella is usually so mild that the patient does well without medicinal treatment. Occasionally the eruption is very abundant upon the face, and the patient is disposed to rub or scratch it on account of the itching. This should be prevented, since the undisturbed vesicle causes no permanent injury to the skin, and disappears, leaving the features smooth; but a vesicle broken and rubbed by the fingers of the child may have such extension of inflammation that a dimple results. I employ for the purpose of relieving the itching of the face, forehead, ears, neck, and other cutaneous surfaces, frequent washing with the following:

℞.	Acidi carbolici,	ʒj;
	Tinct. camphoræ,	fʒij;
	Aquæ puræ,	Oj.—M.

Sig. Apply when needed to relieve pruritus. It should not be used upon any of the mucous surfaces.

The eruption appears upon the buccal and faucial surfaces, upon the edges of the eyelids, and sometimes upon the mucous surfaces of the prepuce and vagina. In these localities it is at times painful, and when so, a 4 per cent. solution of cocaine can be applied by a camel's-hair pencil to the painful part. The eyes can also be bathed with a solution of boric acid, 1 drachm to 8 ounces, and the mouth and other parts, except the eyes, can be bathed with a soothing lotion, as—

℞. Acidi boric., ʒj ;
Sodii borat., ʒj ;
Bismuth. subnitrat., ʒiij ;
Aquæ puræ, fʒviij.—M.
Sig. Shake well before using.

The family can be informed that in two or three days these eruptions, which are painful, will begin to abate.

SMALL-POX.

By WILLIAM M. WELCH, M. D.

Prophylaxis.

Of all the measures employed to prevent the spread of small-pox, none is so important and efficacious as Jenner's great discovery. There is perhaps no single scientific fact better established than that vaccination, periodically repeated, is capable of effectually preventing the occurrence of that disease in man. In view of this fact it does at first sight seem strange that variola should continue to prevail in civilized communities; and, while nothing appears easier than to control the spread of this disease, or even to eradicate it altogether, yet there are difficulties in the way of accomplishing this end which seem almost insurmountable. These arise from various causes, but chiefly from individual carelessness or indifference about employing vaccination, from a want of unanimity of opinion with regard to its efficacy, and from the absence of a general law making it compulsory. I know that many conscientious citizens are opposed to enforcing vaccination by law, but as every unvaccinated person is liable to contract small-pox and disseminate the contagion among others, he should therefore be regarded in the light of a public enemy, and dealt with accordingly. Surely it is not an unreasonable position to assume that no person through ignorance or prejudice should be allowed to contravene the public welfare.

But in the absence of a statutory law requiring the vaccination of all persons, very much can be done in the way of enforcing the measure by restricting the privileges of the unvaccinated. For instance, satisfactory evidence of successful vaccination should be required of every child before admission into public and private schools and institutions for the care of children; no unvaccinated person should be allowed to serve as a soldier in the national army or navy, or in the State militia; and no unvaccinated immigrant should be allowed to land until vaccination has been performed.

In view, therefore, of the great importance of this prophylactic measure to the public, it becomes the duty of all municipal and State authorities to provide gratuitous vaccination for the poor, and, indeed, for all helpless children of improvident parents, no matter to what

class of society they belong. No expenditure of money should be spared by these authorities in order to protect their citizens against a disease so loathsome and fatal as small-pox. From a purely monetary point of view such expenditure is wise, for a single epidemic of this much-dreaded disease in a community may necessitate a greater outlay to care for the indigent sick alone than would be required to purchase the means of protection for that community for a decade of years.

If vaccination were universally practised, and repeated from time to time as circumstances required, there would be little need for other means of prevention; but as it is impossible to attain so desirable a result, recourse must be had to other prophylactic measures, and some of these constantly form quite an indispensable part of the preventive management of small-pox. When this disease appears in a community the chief aim should be to prevent the dissemination of the infection, and of the various means commonly employed to attain this end isolation of the patient is of chief importance. This can only be accomplished with any degree of certainty by having the case removed to a well-organized hospital; and, as it is manifestly improper to treat such cases in general hospitals, it follows that every city and large town should be provided, either temporarily or permanently, with a special place for the treatment of this disease in the event of its outbreak. Certainly, in every large city a permanent and well-equipped institution of this kind is a necessity. It should be located sufficiently remote from the thickly-settled parts of the city as to endanger no portion of the community, while at the same time it should be easy and ready of access. Indeed, the more accessible it is, and the more fully it is provided with modern improvements and comforts, the more willingly and cheerfully will patients consent to removal thereto. It should never be spoken of as a "*pest-house:*" most persons will consent to go to a well-regulated hospital, but to a "*pest-house*" never.

Of course a special hospital of this kind should be managed under strict quarantine regulations. No person, however well protected, should be allowed to visit a patient in the institution except under extreme circumstances, and then only after every possible precaution shall have been taken to prevent his carrying away the germs of the disease. The nurses and attendants should not be allowed to leave the hospital, nor come in contact with other persons, until they have had an antiseptic bath and have changed their clothes. In providing nurses and other employés for the hospital it need not be required that they shall have had small-pox, but they should invariably be revaccinated before entering on duty.

The hospital should be provided with closed ambulances for the transportation of patients. Private or public vehicles should never be used for this purpose. Indeed, this is regarded as so important a matter

that in some large cities in this country the use of any kind of public conveyance for carrying persons affected with small-pox is prohibited by law, and its infringement is made punishable by fine. Besides being closed vehicles, so as to guard as far as possible against the spread of contagion from the patients, the ambulances should also be comfortable. The pain and prostration from fully-developed small-pox require that persons thus afflicted should, when transported, be handled with the greatest care and caution, so that no additional risk to life shall be incurred in consequence of the transfer. Lest infection be spread by the ambulance itself, it should be disinfected and provided with clean bedding, blankets, etc. every time it is used. In order that the public may know the character of the disease it conveys, it should bear the name of the hospital to which it belongs.

Whenever a case of small-pox occurs in a family, the physician's first duty is to vaccinate promptly all members of the family who have never been vaccinated, and revaccinate all others without regard to the character of their previous vaccination. If this be done and the patient sent to the hospital, the disease may be prevented from spreading. When it is known that a person has been exposed to the infection of small-pox, it is advisable not only to vaccinate that person immediately, but to quarantine him for a period of fourteen days; which sufficiently represents the incubation period of variola. The latter purpose doubtless could be most effectually carried out in a place specially set apart for the care of such persons; hence every large city should, in the event of an outbreak of small-pox, improvise a quarantine hospital or station for the temporary detention of persons suspected of having received the variolous infection. Every such person refusing to be confined in this place should be visited daily by a medical sanitary officer for a period of two weeks, or until symptoms of small-pox appear, in which event the case should be immediately sent to the hospital for treatment. These precautionary measures are especially necessary among the poor, whose dwellings are always small and often overcrowded. So also in the larger places of habitation, where there is no suitable apartment for secluding the patient, such as hotels, boarding-houses, public institutions, and all dwellings connected with stores, the same constant vigilance and prompt action in regard to vaccination and isolation are necessary to prevent the spread of the disease.

If the small-pox patient is to be treated at home, every possible effort should be made to seclude him from all persons, excepting only such as are required to act as nurses, and they should be protected by recent vaccination. In selecting an apartment for the patient a room most completely separated from all other parts of the house is preferable; but when this is not practicable—which is usually the case

in the ordinary city residence—the uppermost room of the house should be preferred. It should be well ventilated, and, if possible, have an open fire-place, in which fire should be kept constantly burning. All unnecessary articles of furniture, such as drapery, upholstery, carpets, etc., should be removed. Every precaution in regard to cleanliness and disinfection of clothing, bedding, and everything in use in the room should be exercised, so that the danger of spreading the infection shall be reduced to the minimum. A sheet wrung out in a strong solution of carbolic acid, Labarraque's liquid, or some other disinfectant, and suspended across the doorway, may aid in preventing the infection from being disseminated to other parts of the house. While it is impossible to practise aërial disinfection in an apartment occupied by a patient, yet the common practice of placing chloride of lime or some other disinfectant about the room undoubtedly serves a useful purpose, and should be encouraged. If these agents do nothing more, they certainly aid in correcting the bad odors which arise, and thus render the atmosphere of the room more agreeable to the patient and his attendants.

So long as a dwelling is infected with small-pox the entire household should cease to associate with the public. The attendance of the well members at church and other public assemblages should by all means be interdicted. The children should be required at once to leave school, and should not be readmitted until the family physician or some qualified sanitary officer certifies that the sickness has ended, that the house has been thoroughly cleansed and disinfected, and that the danger of conveying the infection to others has ceased to exist. It seldom happens that it is necessary to close a school on account of an outbreak of small-pox in the neighborhood, or even among the pupils, since protection can be so easily and certainly secured from properly-performed vaccination and its timely repetition. Indeed, well-marked evidence of previous vaccination should constitute a prerequisite of admission of children into all schools, public or private. If this rule were strictly observed, school authorities would have but little to fear from the contagion of small-pox.

When small-pox makes its appearance in a house, the well members of the household should, as a rule, not be removed, except to a quarantine station or hospital. For if removed to another locality, and the disease should subsequently appear in any of them, a new centre of infection would be established. Better by far would it be to vaccinate or revaccinate all such persons, and have them remain on the premises under sanitary supervision. To depend upon them to practise self-denial of their personal liberty voluntarily for the welfare of the public would be trusting too much to the weakness of human nature; hence, doubtless, the best results would be obtained by furnishing reli-

able guards to enforce not only isolation, but also compliance with all other necessary precautionary measures. Unfortunately, this procedure, if properly carried out, would probably prove too expensive to be feasible when small-pox is prevailing in a community to any considerable extent; but it would be entirely practicable to deal with the first cases in this manner. Surely, no expenditure of money, however great, would prove more prudent and economical in the end than that made for providing the means of limiting the outbreak of the disease to the original case or cases.

Another means of restricting the spread of small-pox is to apprise the public of the particular locality where the disease exists, so that no one may unknowingly approach within infecting distance of the place. But how to do this without exciting unnecessary alarm is a problem not easy of solution. The plan adopted in some cities of placarding the infected house with a large and conspicuous poster is believed by many to serve a useful purpose, notwithstanding it frequently meets with much opposition. The latter fact, however, is suggestive that the plan might also prove useful as a means of forcing the consent of patients to removal to the hospital as an alternative. But whether this plan be adopted or not, the sanitary authorities should keep the premises under constant supervision, instituting daily visits by officers qualified and empowered to advise and direct the observance of all necessary sanitary precautions, and, if there be danger of non-compliance, to enforce the more arbitrary and restrictive measures already recommended.

Disinfection is a highly important prophylactic measure. The infection of small-pox is not only imparted to the atmosphere surrounding the patient, but to all articles which have been used by him or been near him. It clings to these articles for a variable length of time, and they are therefore not unfrequently the media by which the infection is conveyed to others. Disinfection consists in the complete destruction of the infecting agent or germs of the disease, and it thus renders infected articles innoxious. Fresh air and sunlight are, in a certain sense, disinfectants; at least, when infected articles are freely exposed to the atmosphere and rays of the sun for some time, the infecting principle becomes less and less active, and finally disappears. Therefore the house, and especially the room, occupied by the patient should be freely though cautiously ventilated. If the weather be cool, an open fire upon the hearth would contribute very much to the change of air in the room, and it would also consume much of the infected atmosphere.

Chemistry, however, furnishes the more speedy and reliable disinfectants, and it is upon such that we mainly depend for the destruction of the disease-germs. Some one of these chemical agents should be

brought directly in contact with all excrementitious matter from the patient, and with everything which has been used by him or been near him during the progress of the disease. All discharges, not excepting those from the mouth and nose, should be received into a vessel containing some such disinfectant as chloride of lime, carbolic acid, or bichloride of mercury. Under no circumstances should the excreta be allowed to flow into the sewer or be cast away without first having undergone disinfection. In country districts, where disinfectants may not be readily obtained, the discharges should be deeply buried in the ground in a locality where there is no danger of contaminating the water-supply. Every handkerchief, towel, and article of bedding and clothing used by the patient should be steeped for some time before leaving the room in a solution of 2 fluidounces of chloride of zinc or 4 fluidounces of strong carbolic acid to the gallon of water, and afterward boiled by themselves for half an hour or longer in plain water; all small articles, such as bits of linen, sponge, absorbent cotton, and the like, should be burned immediately; all utensils used for eating and drinking should be purified by boiling water; and, in short, nothing should be allowed to leave the room without having first been subjected to some form of disinfection.

The attendants should not be more numerous than the necessities of the case require. They should be carefully instructed in regard to the importance of cleanliness, disinfection, and isolation. Not only should they be instructed to exclude from the sick-room all persons not having authority to enter, but also all domestic animals, such as the dog and cat, as they are exceedingly liable to serve as conveyers of the infection.

The clothing of the attendants should be of such material as can be readily boiled and washed, and it should be frequently changed and subjected to this process. An attendant should not come in contact with other persons while engaged with the case. On leaving, either temporarily or permanently, a bath should first be taken, using freely carbolic-acid soap, and the hair should be washed with a weak solution of mercuric chloride. No clothing should be worn or carried away from the premises that has at any time been in the infected atmosphere, unless it has first been disinfected.

Physicians also should exercise care lest they may be the means of communicating the contagion. When called upon to attend a case of small-pox the physician should not remain in the infected atmosphere longer than is necessary to make a proper examination; the prescription may be written and advice given in another apartment. After each visit he should carefully wash his hands, face, and hair; his hands especially should be washed in some disinfecting solution. He should then expose himself for a considerable time in the open air before

visiting another patient. But if much time has been spent in the infected atmosphere he should certainly return home, wash again, and change his outer clothing. The clothing which is removed should be hung up in the open air for several hours. If the case be long and tedious, it would be advisable for the medical attendant to have his clothing disinfected after attendance has ceased, or even before, if necessary. It is not a bad plan, as suggested by some, for the physician to wear into the sick-chamber a long mackintosh, or even a linen duster, buttoned up to the chin, and to keep the garment hanging in the open air in the intervals of his visits. In hospitals, where there are many patients to be examined, and where he is required to spend considerable time in the wards, nothing short of a change of his entire outer clothing before leaving the institution would be advisable.

The isolation of a small-pox patient should be continued until all the scabs are removed, and even then he should not be allowed to associate with the public until he has had one or more antiseptic baths. Perhaps the most reliable antiseptic bath that can be given is one containing corrosive sublimate. Great care, however, should be taken that none of the solution enters the patient's mouth. The safest way to proceed in the use of such a bath is, I think, simply to sponge the body and carefully wet the hair with the solution (1 to 2000), and then have the patient freely bathed in plain water, with the use of carbolic-acid soap. A 5 per cent. solution of Labarraque's liquid also makes a very reliable disinfecting bath. After this he should put on clothing which has not been exposed to the infection, or, if exposed, has been disinfected, and he may then safely mingle with the public.

Inasmuch as the body of a person who has died of small-pox is capable of imparting the infection, some precautions should be observed in regard to it. For instance, the body should be thoroughly wet with a solution of corrosive sublimate (1 to 500), or with a solution of chloride of lime in the proportion of 6 ounces of the drug to a gallon of water, or with some other equally powerful disinfectant; besides, it should be wrapped in a sheet saturated with one of these solutions and buried at once. The preferable method of disposing of the dead from this disease is by cremation; but this method is yet perhaps too strongly opposed by public sentiment to be practicable. It is not advisable to transport the corpse a long distance or from one city to another for burial, but if this be really necessary, it should first be placed in a metallic coffin hermetically sealed. In its burial, it should be put at least six feet under ground, and should not be disinterred unless absolutely necessary, and then only under sanitary supervision. The vehicle used for conveying the body to the grave should afterward be disinfected. It is perhaps unnecessary to say that the funeral should by no means be public.

After the sick-chamber has been vacated, either by the recovery or death of the patient, every article of no great value which it contains should be immediately burned. Everything else which will not be injured by the ordinary operations of the laundry may be safely and cheaply disinfected by immersion in boiling water for half an hour. It should be remembered, however, that the water must be maintained at the boiling-point for that length of time. But if it be impracticable to subject such articles at once to the boiling process, they should be immersed for about four hours in some reliable disinfecting solution—such as mercuric chloride in the proportion of 1 to 2000, or carbolic acid 1 to 50—and subsequently boiled. Heavy clothing, pillows, hair mattresses, and other articles which cannot be boiled and washed should be hung up in the room and subjected to the influence of sulphur dioxide. This may be accomplished by burning in the room, after it has been made as nearly air-tight as possible, 3 pounds of sulphur to every 1000 cubic feet of air-space. After this, the room should remain closed from twelve to twenty-four hours, then be opened, thoroughly ventilated, and all surfaces, including that of furniture, washed with a disinfecting solution (chloride of lime or carbolic acid 1 to 50, or mercuric chloride 1 to 1000); afterward the floor and other woodwork should be thoroughly scrubbed with soap and water. The wall-paper, if there be any, should be well moistened with the carbolic-acid solution and scraped off and burned. Paper may be reapplied or the walls whitewashed, according to fancy. In addition to all these precautions, it is advisable to have the room remain unoccupied for three or four weeks, during which time it should be well aired.

For disinfection of outer clothing, carpets, bedding, and all articles which cannot be boiled, there is nothing superior to steam. The germs of small-pox will certainly perish if exposed for half an hour to this agent at a temperature of 212° F. There are, however, certain articles which would be injured by moist heat, and for the disinfection of these dry heat may be substituted. In this case a temperature of at least 230° F., and continued for two hours, will be required.

As most of these requirements would only be indifferently carried out by the average citizen, and as some could not be attempted at all for the want of proper facilities, it is evident that local sanitary boards should be vested with authority and provided with ample means to take charge of every house in which small-pox makes its appearance, and apply the necessary measures for the eradication of the infection. The work of disinfection should always be conducted by a properly qualified sanitary officer, and, as it is done in furtherance of public safety, the public treasury should supply the means. In every large

city, as has been so pertinently remarked by an experienced sanitarian,[1] some suitable place should be provided for disinfecting, without cost to the poor and at a nominal cost to the well-to-do, all portable articles, particularly such as cannot be conveniently or satisfactorily cleansed and disinfected at home, such as beds and bedding, woollen clothing, and the like. "Such articles," continues this sanitarian, "could then be removed, with due precaution, in a wagon specially prepared for the purpose; those of no value being burned in a furnace, and the remainder, after being cleansed and thoroughly disinfected by steam, dry heat, or by chemical agents, according to circumstances, returned to the owners. This plan will prevent serious embarrassment, and will ensure a more complete purification than can be expected under ordinary circumstances; and its general observance will unquestionably do much toward the preservation of the public health." In cities where this method has been adopted its benefits have been clearly proved.

In order to afford health authorities the earliest opportunity to apply any or all of the measures which have been indicated for restricting and preventing the spread of small-pox, every case of the disease should be promptly reported to them so soon as its nature is determined. In some municipalities the physician in attendance is required to give such notification—a requirement which, I think, is not unreasonable. Unquestionably, every practitioner of medicine should feel himself called upon to sustain the sanitary authorities in their efforts to prevent or stamp out a pestilential disease, and should willingly comply with any requirement whose object is the attainment of so desirable an end. Surely, no one who properly appreciates the dignity of his calling would connive at the concealment of a disease whose existence endangers the public health. It has been truly said:[2] "No obligation to the patient or his friends is required of the physician to keep the nature of the disease a secret; on the contrary, by so doing he lowers his profession and dishonors himself, in that he wrongs the public by pandering to the selfish interests of the few."

Treatment.

In the management of small-pox greater progress has been made in the direction of prevention than of cure. Since the general introduction of vaccination epidemics of this once widespread and fatal scourge have greatly diminished in frequency; hence opportunities for studying the course and treatment of the disease in the present age occur only periodically, and these periods are often widely separated. For this reason, doubtless, the current literature of medical science contains

[1] Wm. H. Ford, M. D., President Board of Health of Philadelphia, "The Preventive Management of Small-pox," *Medical News*, March 11, 1882.

[2] Ford, *loc cit.*

less in regard to the treatment of this than of most other infectious maladies.

The type of small-pox has also been very considerably changed by vaccination. Where this agent does not confer immunity from infection, it is still quite sure to exercise a more or less marked modifying influence over the disease, according as the period at which it was employed is near or remote. Cases of small-pox thus modified are known as varioloid, and they may assume various grades of severity—from the mildest form possible to that barely distinguishable from the unmodified disease. In the management of the milder cases but little is required besides the employment of hygienic measures; the severe cases of this class, however, demand very careful attention, and even then death not infrequently results. But even where the protective influence of vaccination seems to be entirely lost, there is often sufficient of this influence remaining to cause a slight abridgment in the course of the disease, and thus a severe case is often helped through to a favorable termination. It is therefore easy to understand how a certain drug, or some special method of therapeutics, may acquire an unmerited reputation in the treatment of post-vaccinal small-pox.

Unmodified small-pox has always been a very difficult disease to manage, and the treatment, of course, has varied greatly in different ages. One of the earliest methods of treating the disease consisted in placing the patient in a bed surrounded with red hangings, covering him with red blankets and a red counterpane, having him suck the red juice of pomegranates, and gargle his throat with mulberry wine. It is said that Prince John, son of Edward II. of England, was treated in this way, and that his medical adviser took to himself no small credit for having brought his royal patient safely through the disease.

Later on, the treatment was for a long time equally erroneous, although not governed by the same superstitious belief. It was the practice for centuries to bleed largely and repeatedly, to purge, to blister, to apply heating lotions, to administer heating drinks, and to do many other irrational things. Without reproaching in the least our ancestors, who did the best they knew, yet their method of treatment cannot be too strongly condemned, since measures so depressing must of necessity cripple the powers of nature and add to the malignancy and fatality of the disease. More recently we have come to a recognition of the important fact that small-pox in its fullest development is so exhausting in its effects as to tax to the utmost all reserves of vital energy, and that it is our duty to conserve by every possible means the vigor of the patient.

It must be admitted that there are as yet no drugs known to exert the slightest influence in either shortening or modifying the course of small-pox. In view of the light, however, which is now beginning to

dawn on the nature of infecting agents of all contagious diseases, it does not seem altogether visionary to believe that the time is approaching when we shall be able to introduce into the blood a chemical substance which will render it an unsuitable soil for the multiplication and growth of infectious microbes. Surely, it does not appear impossible that through the great and rapid progress now being made in pharmacology and therapeutics there will yet be manufactured for us such substances as shall possess the particular action desired. The great advancement made during the last few years in chemistry, by which the synthetical method of obtaining various complex products has been rendered possible, affords ground for hope that we shall yet be able, not only to combat more effectually the pathological processes of small-pox, but also to destroy or antagonize the cause of the disease itself. Until this new era arrives, however, we must be content with a treatment based on rational principles.

In order to consider in detail the treatment of small-pox it seems most convenient to divide the disease into its various stages, as follows: 1. The Stage of Incubation; 2. The Initial Stage; 3. The Eruptive Stage; 4. The Stage of Suppuration; 5. The Stage of Retrogression, or Stadium Exsiccationis; 6. Convalescence.

The Stage of Incubation.—The interval between the reception of the infecting agent of small-pox into the blood and the earlier manifestations of disease is usually unattended by symptoms. There is no doubt, however, that certain unknown processes take place during this period. It is very important to know whether anything can be done at this time to arrest or change these processes so as to prevent or modify the approaching disease. Drugs, of course, are powerless for this purpose. Is vaccination at this period capable of exerting any such influence? This question has been answered in both the affirmative and negative. Some have advanced the opinion that when the micro-organisms of variola have gained access to the circulation the subsequent introduction of the micro-organisms of vaccinia can have no other effect but that of accelerating the action of the former. This opinion is based on the assumption that the micro-organisms of both these affections are identical. Hence, the few who hold to this view denounce vaccination at this stage of variola as not only useless but harmful, claiming that it tends to precipitate and intensify the incubating disease. I need only say that this view is altogether theoretical, and wholly unsupported by experience.

From the clinical reports of those who have made extensive use of vaccination at this period of small-pox there seems to be some difference of experience concerning its efficacy. In commenting on this question Curschmann says:[1] "Are we able to exert any influence on

[1] *Cyclopædia of the Practice of Medicine*, Ziemssen, vol. ii.

the disease in the early stage preceding the eruption? Is it possible in infected persons, during the stages of incubation and invasion, to cut short the disease or to modify its course? Many attempts have been made to answer these questions affirmatively, but as yet without much result. The first idea was vaccination, and this was employed by some in the ordinary way; by others subcutaneous injections of vaccine-lymph have been given, it is said, with good results. I must, however, advise great scepticism regarding these assertions. Of the subcutaneous injection of lymph I have no experience; but that ordinary vaccination during the stages of invasion and incubation cannot stay the disease has been proved to me by chance observations and direct experiments. On the contrary, I have seen, in cases in which vaccination was practised after infection with variola, vaccine pustules and small-pox pustules developed side by side. It is, in my opinion, very doubtful whether vaccination can even render the course of the disease milder.

The hypodermic use of vaccine lymph is certainly not entitled to any confidence as a prophylactic measure. Immunity does not result from the mere presence of the lymph in the blood, but from certain unknown processes which take place in the system in the course of true vaccinia. It is therefore evident that the vaccine disease must reach a certain stage of development before it is capable of exerting any prophylactic power whatsoever. I have had very frequent opportunities of witnessing that vaccination during the invasive or initial stage of small-pox is utterly valueless, and also that it is equally valueless when performed no longer than three or four days prior to the earlier invasive symptoms. The vaccine vesicles resulting from vaccination practised at this period, and the variolous pustules, will, it is true, develop side by side without the one exerting any influence whatsoever over the other. But Curschmann's experience seems to warrant the inference that at no time within the incubation period of small-pox can vaccination be used with advantage against the approaching disease. If such is his experience, it certainly differs very greatly from my own. I have in numerous instances seen small-pox very markedly modified by vaccination performed at this period, and not unfrequently have seen it prevented absolutely. In order that protection shall be complete it is necessary that the insertion of the vaccine lymph should be made almost immediately after the reception of the contagium; but if made at a somewhat later date a modifying effect may be obtained. No part of the incubation period should be considered too late to make use of this remedy, since this period is sometimes prolonged beyond its usual limit, in which case a late vaccination may prove of value.

It is my opinion that vaccinia does not begin to exert its prophylactic power until the areola commences to form around the vesicle. At this time the mild febrile reaction, regarded by Jenner as a *sine quâ*

non in true vaccinia, becomes apparent. If this stage of the vesicle be reached before the patient shows any symptoms of small-pox, the disease may be entirely prevented; if not reached until after the febrile symptoms appear, but before the eruption occurs, it may modify the attack. Now, it is well known that in typical vaccinia the areola appears about the seventh or eighth day from the date of insertion of the lymph, and is at its height on the ninth or tenth day; and it is equally well known that the incubation period of variola is, in the majority of cases, of ten or eleven days' duration, and that the eruption does not appear until about three days later. This renders quite obvious the fact that vaccination, practised shortly after variolous infection has occurred, has an opportunity in point of time to exert more or less prophylactic influence against the incubating disease. While no inflexible rule can be laid down, yet it may be said in a general way that if vaccination be practised on the first or second day after the reception of the infection the protection may be perfect; and if employed between this date and the fifth day, it may be partial. But I would emphasize the fact that after infection has occurred, every day that is allowed to pass before resorting to vaccination is so much valuable time lost.

While the appearance of the areola generally indicates the period of the vaccine process at which its prophylactic power begins to be exerted, yet this period may vary somewhat in different individuals. For instance, I have more than once seen, say, two persons exposed to the contagion of small-pox at the same time, and in such a manner that there could be no doubt about infection occurring—have vaccinated these persons at once and with the same virus, and the vaccinia in both cases has pursued identical courses, yet in one case the protection was perfect, while in the other it was only partial. In other similar instances one received partial protection and the other none at all. This difference is doubtless due to some individual peculiarity that cannot be explained.

It is much easier to confer protection against small-pox after infection where revaccination is required than where the vaccination is primary. The explanation of this is not difficult. It is because vaccinia in its modified form—such as results from revaccination—develops more speedily, arrives at the areolar stage more quickly, and runs its entire course several days sooner, than does unmodified or true vaccinia; hence it is clear that the period of protection in such cases must be reached earlier. But as there is no uniformity in the course of vaccinia induced by revaccination, of course in that form of the disease in which the vesicle more nearly approaches the true standard the later in the vaccine process will the period of protection be reached.

In endeavoring to confer protection at this stage of small-pox the quality of the vaccine lymph employed has a great deal to do with

success. I have never been able to succeed well with animal lymph. It is too unreliable, and when it does succeed in inducing vaccinia the process is usually so slow that it does not reach the stage at which protection is exerted before the symptoms of small-pox appear. Nothing is of more vital importance at this period of the disease than that the vaccine virus employed should be fresh and active. The difference between succeeding and failing in producing vaccinia at this time often means to the patient the difference between life and death. I know of no virus that is more reliable or will give better results than eighth-day lymph taken directly from a typical vaccine vesicle on the arm of an infant. But as this virus can seldom be obtained when needed for this purpose, next to it I prefer humanized virus in the form of crust from a healthy infant; and I have a very decided preference for that which has resulted from a long series of human transmissions. There is no question that vaccinia induced by such virus runs a much shorter course than that which results from animal lymph, or even from virus of recent humanization. The vaccine in use in this country prior to the introduction of animal vaccination (in 1870) induced a decidedly modified type of vaccinia, whose duration, counting from the insertion of the virus until the falling off of the crust, was only fourteen or fifteen days. It is evident that vaccinia of this character is attended by a more speedy development of the vesicle and an earlier appearance of the areola than is the case in the more typical form of the disease, and consequently can be used with greater effect against incubating small-pox. I need hardly say that where time is not so important an element vaccine which produces the typical Jennerian type of vaccinia is greatly to be preferred, for I believe it confers protection of greater durability.

There is no doubt that the milder type of vaccinia, or that resulting from long-humanized virus, is capable of conferring complete immunity against small-pox for a variable length of time. The best prophylactic results that I have had from vaccination after variolous infection have been from the use of such virus, and I attribute this wholly to its reliable and speedy action. In using this virus it is advisable that a number of insertions be made, as this not only increases the chances of inducing the vaccine disease, but tends to bring the system more effectually under its influence. Furthermore, it is believed by some authors that multiple insertions quicken the processes of vaccinia, and thus hasten the attainment of that stage of the disease at which its prophylactic power begins to be exerted. Waterhouse was of this opinion, and his remarks on the subject are interesting because they were made nearly a century ago, in the very earliest history of vaccination. He wrote: "I think it proper to publish an important fact for which we are not indebted to Europe—namely, *If a*

person be inoculated with the kine-pock two days after having received the casual infection of small-pox, the kine-pock will predominate and save the patient. Nay, I will go further and say in some cases *three days* posterior to infection instead of two; for there is a mode of expediting the operation of the kine-pock virus by increasing the quantity of matter thrust under the epidermis; and it appears, from experiment, that this does not depend so much on increasing the quantity put into a deep puncture as it does on the increase of infected surface. In other words, you may expedite the processes of kine-pock inoculation two days, if not three, if, instead of two punctures, you make sixteen or twenty;" . . . . "and on the sixth day from the operation we shall have the appearance of the eighth day in ordinary cases; and on the eighth day we shall find the appearance of the tenth, and so on with the febrile symptoms, in which commotion the prophylactic power consists."

As there is nothing at this stage of small-pox of greater importance than vaccinia attended by prompt and speedy development of the vesicle, it is evident that the virus employed should be selected and used with the greatest possible care and skill. Humanized crusts are not all equally reliable and active, and it requires more experience and closer attention to distinguish between those which can be trusted and those which cannot than is generally supposed. In order to ensure success, it is advisable when possible to employ virus from more than one source. It is desirable at this time to guard as far as possible not only against failure, but also against a vaccine disease of slow progress. A tardy vesicle, or one that is slow in making its appearance and late in arriving at maturity, gives no assurance of safety. From the use of bovine lymph, especially that form which is now furnished in a dried state on ivory points, it is not unusual to find the vesicles two, three, or more days late in making their appearance, and correspondingly late in reaching the areolar stage. Such a vaccination of course could scarcely be expected to modify the approaching disease, much less prevent it.

It has been suggested by some that variolous inoculation might be practised with advantage where too great a length of time has elapsed since exposure to the contagion of variola for vaccination to be of any benefit. But besides the legal objection to such a procedure, there is often the difficulty of determining the exact day on which infection occurred, especially when the disease breaks out in a private family, and without this knowledge it would be impossible to say of any such case that it is too late to confer protection by vaccination. Perhaps I can best illustrate what I mean by citing one or two examples of vaccination after infection out of very many such recorded in my record-book. A mother and her four children were admitted into the small-pox ward of the hospital under my care; the mother was suffering

from small-pox, which had advanced to the seventh day of the eruption, while all the children were still in good health. Three of the children were unprotected by vaccination, and the other, a girl of eight years, had been vaccinated in infancy. All four of the children were at once vaccinated. The girl who had been vaccinated took vaccinoid, and enjoyed immunity from small-pox. The other three children developed regular vaccinia; of these, one was perfectly protected, another had an exceedingly mild form of varioloid, and the other, unfortunately, suffered from unmodified small-pox and died.

The very last group of variolous cases which, up to this time, has been admitted into the hospital illustrates not only the same facts, but also the fatal consequence of vaccination unsuccessfully performed when the contagion of variola is within infecting distance. The history of this group of cases is as follows: On April 28th a mother and her two children—one aged four years, and the other eight months—were brought to the hospital on account of the younger child suffering from confluent small-pox; the mother and the older child being still in good health. The disease in the younger child had advanced to the sixth day of the eruption; death occurred three days subsequently. The infection in this instance had been received from an adjoining house where the disease was prevailing. On account of the nearness of the contagion an attempt had been made to vaccinate both these children some four or five weeks previously to their admission, ivory points containing animal lymph having been used; but the only result obtained was spurious, consisting at the point of insertion in both cases of a small red elevation resembling a red raspberry. The mother had been vaccinated in infancy, and showed two good cicatrices, which rendered her immune against small-pox, and also against revaccination. The well child, aged four years, was vaccinated a few hours after admission, humanized virus being used. Three insertions were made, two of which developed into typical vesicles. On May 7th a few variolous papules—twenty-two by actual count—appeared. About a half dozen of these became very slightly pustular, but disappeared quickly, and without leaving any pitting whatsoever. Prior to the appearance of the eruption the temperature was for two or three days 101° to 102° F., but the child ate as usual, and played about the ward, being at no time ill enough to be confined to bed.

The sum of my experience in vaccination during the incubation stage of small-pox amounts to 159 cases. As the space at my disposal will not permit of anything like a detailed account of these cases, I can only refer to them in such a way as to show general results. The vaccinations were all primary, and were performed at various periods of this stage—anywhere from immediately after the reception of the contagium until within two days of the appearance of the eruption. As

the cases were all under observation in the hospital, where they came in the closest possible contact with numerous small-pox cases, there can be no question that the contagium was present in sufficient quantity to ensure infection.

Of the 159 cases, 29 were perfectly protected against small-pox; 14 almost perfectly protected; 20 protected to a well-marked degree; 24 partially protected; and 72 were unprotected.

In support of the statement already made—namely, that the vaccine disease does not begin to exert its prophylactic power until the vesicle has reached the stage at which the areola appears—I present the following statistics: Of the 159 cases, 57 were vaccinated on various dates ranging from one to seven days before the eruption of small-pox appeared, and of these 25 died, giving a death-rate of 43 per cent. In 102 cases vaccination was performed at an earlier period of the incubation stage, and of these only 14 died, giving a death-rate of 13 per cent. Of these 14 deaths, 11 occurred among persons who, before admission to the hospital, had been vaccinated with animal lymph, and the vaccine vesicles were, in most instances, of very tardy development. The value of vaccination during this stage of variola becomes still more apparent when these death-rates are contrasted with the death-rate of the unvaccinated cases, which amounted to 58 per cent.

The Initial Stage.—The initial stage of small-pox comprises the period between the earliest manifestations of disease and the appearance of the eruption, and has a duration usually of about three days. After what has been said of the power of vaccination after variolous infection, or of the hypodermic use of vaccine lymph, recommended by Furley,[1] it is needless to consider further either of these means as a remedy at this stage of the disease. Bloodletting, formerly so much employed, is now almost never resorted to, not even for the relief of symptoms. Quinine, in large doses, has been recommended as exerting a favorable influence over the course of the disease, but the experience of Curschmann and others shows that it possesses no such value. In short, all attempts to stay the disease, or even modify its course, have proved unavailing, and we can do nothing more at this stage than treat special symptoms as they arise.

The popular though erroneous notion of past centuries, that it is necessary to keep the patient hot and sweating, still prevails to some extent, and not unfrequently it is found very difficult to overcome this prejudice. On the contrary, every effort should be directed toward keeping the patient as comfortable as possible, and experience shows that a bed-room well ventilated and having a temperature of from 65° to 70° Fahr. is best suited to this purpose. The ordinary

[1] *Lancet*, May 25, 1872.

febrifuge mixtures, such as liquor ammoniæ acetatis, liquor potassii citratis, tinctura aconiti, etc., may be given in suitable doses and at stated intervals. I myself am in the habit of using the following formula:

℞. Spirit. æther. nitrosi,
Syrupi limonis, āā. f℥iv;
Liquor. ammonii acetatis, f℥v.—M.
Sig. Give 2 to 3 fluidrachms every two hours, in a little ice-water.

If there is irritability of the stomach, the effervescing citrate of potassium may be preferable. It sometimes happens that the stomach is very irritable, especially in children; in this case lime-water, subnitrate of bismuth, aromatic spirit of ammonia, a little chloroform-water, or any other drug or agent known to be of service in this condition, may be used. The swallowing of small pieces of ice will often give relief when everything else fails. When the skin is hot and dry and the temperature high, frequent sponging with cool water is serviceable. Severe headache may call for the application of cold water, iced compresses, or an ice-bag to the head. These measures need not be feared on account of the common impression that they tend to suppress the eruption, for such is not the case.

Nervous symptoms, such as insomnia, delirium, and convulsions, are often prominent features of the disease and demand appropriate treatment. Some one of the bromide salts, or chloral, given either separately or in combination, will usually succeed in subduing these symptoms. For the convulsions of children there is perhaps nothing more effective than chloral, given either by the mouth or rectum. When given by the mouth it should be well diluted, since it is very irritating to the throat, which is liable to become implicated in the variolous process quite early. Warm baths are also very useful. There is another nervous symptom commonly present at this stage of small-pox, and that is pain in the back. This is sometimes so distressing as to call for measures of relief. When the stomach is retentive Dover's powder may be given, or some one of the analgesic coal-tar products, now so frequently used to relieve pain, may be employed. Sometimes there is a good deal of restlessness and general irritability; in such cases I have found a little morphine, combined with the prescription given above, to act most happily.

The common practice of applying mustard to the back for the relief of pain or to the epigastrium to lessen gastric irritability cannot be too strongly condemned, since the variolous eruption always appears in much greater abundance on irritated surfaces. Wherever there is an

ulcer, a wound, or an excoriated condition of the skin, there the pustules are sure to be found in dense clusters. I have frequently seen the eruption intensely confluent over regions of the skin where a mustard plaster had been applied during this stage of the disease. Some have thought that the eruption might in this way be diverted from the face to other localities, but I am convinced that it is not diminished anywhere else by reason of its confluence on these parts through the action of a sinapism; rather is it increased to that extent.

The digestion at this stage is not vigorous; hence the diet should be light and easily assimilated. There is nothing perhaps more suitable than animal broths and milk. The best beverages are cold water and iced lemonade. Acidulated drinks seem to be particularly grateful to the palate. Gentle cathartics may of course be administered whenever indicated.

The Eruptive Stage.—The eruptive stage may be said to comprise a period beginning with the first appearance of the eruption and ending when pustulation has fully occurred. The duration of this stage in variola vera is usually about seven or eight days, but in modified small-pox it is shortened in proportion to the degree of modification. The great desideratum for this period of the disease is a remedy capable of diminishing or modifying the cutaneous manifestations, for there is no doubt that recovery of the patient almost always depends upon the quantity of the eruption and the length of time which it consumes in running its course. Formerly it was thought that some modification might be brought about by bloodletting, but experience shows that the most confluent eruption has succeeded to the most vigorous employment of the lancet. It is therefore worse than useless to bleed, for by so doing we expend that power which will be required later on to repair the injury done by the disease.

In order to control the course of the disease it is necessary to find some agent capable of antagonizing its pathogenic forces. Efforts have been made to accomplish this end by the internal and external use of various antiseptic or antizymotic drugs, and some of these have been vaunted as efficacious; but it must be truly said that no one of these drugs has as yet established for itself the claims put forth respecting its value. I have experimented with a few of the antiseptic remedies which have been highly recommended from time to time, but with results so discouraging as to lead at once to their abandonment. A few years ago I subjected 7 patients suffering from unmodified small-pox to the use of sulpho-carbolate of sodium, administering 20 grains every three hours: 4 of this number began taking the drug on the second day of the eruption; of these, 1 lived three days; 1 five days; 1 eight days; and the other fifteen days. Two began its use on the fourth day of the eruption; of these, 1 lived two days, and the other three

days. One began its use on the fifth day of the eruption, and in twenty-one days death occurred. It is seen that every one of these patients died. To be sure, they were all severe cases—all of them confluent, and some malignant. But they certainly represent a class of cases in the management of which something more than the ordinary treatment is required.

Besides the drug just mentioned, I have tried a few other antiseptic remedies, such as salicylic acid, salicylate of sodium, and carbolic acid; the latter both internally and externally. But I cannot say that I have seen any beneficial result from the use of any of these remedies. With xylol—which, according to Zülzer, coagulates the contents of the pustules and cuts short their development—I have had no experience.

The internal use of sulphur has been favorably mentioned as a remedy. From the fact that this drug is eliminated by the skin it has been thought that it ought to be peculiarly beneficial in the treatment of small-pox. Dr. Iscar of France claims that he has used it with success, and recommends for children the following formula:

℞. Sulphur. lotum, ʒiiss;
Glycerini,
Aquæ aurantii flor., āā. fʒxv;
Syrupi simplicis, fʒviiss.—M.

Dose, a tea-spoonful every hour.

The local use of antiseptics in variola is also spoken of very favorably by some writers, particularly M. Bianchi, who reports excellent results from the following method: The patient is first bathed in a solution of 1 : 20 of boric acid, using with this bath antiseptic soap. During the course of the disease, baths in the boric-acid solution, or in a solution of corrosive sublimate 1 : 1000, are used every four hours. After each bath the patient is anointed with iodoform and vaseline, from 1 to 5 : 100, according to the severity of the case. When possible the pustules are opened with an "aseptic needle" and their contents evacuated. The patient is then wrapped in aseptic linen, which is frequently changed. It is claimed by the author that this treatment notably diminishes the duration of the eruption, lessens the fever, prevents severe ulceration and scarring, and thus leads to rapid convalescence. Similar results are said to have followed the use of baths containing permanganate of potassium, the salt being added until the water is of a rose-red color.

Corrosive sublimate has also been recommended locally in the form of spray. Talamon employs what has been styled, "the sublimate-ether spray," which I believe is prepared as follows:

℞. Hydrarg. chloridi corrosivi,
Acid. tartarici, āā. gr. xv;
Alcoholis (90 per cent.), ʒiss;
Ætheris, q. s. ad fʒiij.—M.

This is to be used by a hand-spray two or three times daily, and, as it is caustic, care must be taken not to throw it into the eyes nor in proximity to the nostrils of the patient.

Looking back over the literature of the subject, I find that the antiseptic treatment of small-pox just described is nothing more than the revival of an old practice which for many years was abandoned. It is true that when these agents were used a half century and more ago, it was not because they possessed antiseptic properties, for the germ theory was not then known; but this, certainly, could have made no difference in the results. As long ago as 1843, Gregory wrote:[1] "The latest mode of treating the surface during the maturative stage of small-pox is that of applying mercurial plasters containing calomel or corrosive muriate of mercury, or covering the whole surface with mercurial ointment. In the French hospitals at the present time the latter mode is in fashion. The reports which have reached me of its success, however, are not very flattering. I have seen all three plans fairly tried at the Small-pox Hospital. The ointment and calomel plasters were inefficient. The plaster of corrosive sublimate converted a mass of confluent vesicles into one painful and extensive blister, but I am still to learn what benefit the patient derived from the change."

Until some special treatment for small-pox is proved efficacious, we cannot do better than treat this stage of the disease on the same principle as the preceding one—by regulating the condition of the patient and giving attention to special symptoms as they arise. Usually it is not until the eruption appears that the disease is recognized and its severity prognosticated. If the case promises to be at all severe, all flannel under-garments should be at once removed, and the hair cut close, so that the head may be kept cool, cleanliness enforced, the risk of cellular inflammation of the scalp diminished, and a better opportunity afforded for the employment of cooling lotions should delirium or more urgent brain symptoms arise.

The febrile symptoms which usher in the disease now usually remit, but increase again as the eruption progresses. For this condition the remedies already mentioned may be employed. It sometimes happens in a depressed condition of the system, particularly in children, that the extremities and even the surface of the body are cool, and that the eruption is too slow in making its appearance. In such cases the application of heat and the administration of hot, stimu-

[1] Gregory on *Eruptive Fevers*, Bulkley.

lating drinks, such as hot toddy, may be of service. This condition in children is apt to be associated with convulsions, in which case there is nothing better than a warm bath, followed by an envelopment in warm blankets. Should the convulsions continue, however, chloral, by either the mouth or rectum, is quite sure to give relief. I repeat here the caution not to fail to dilute the chloral freely, for the throat is now so much involved in the variolous process that an irritating draught may give rise to croupous symptoms, or even acute œdema of the glottis.

As the eruption progresses, not only the throat but the soft palate, the buccal mucous membrane, the larynx, and sometimes the trachea, become more or less involved in the process, which is often the source of difficult and painful deglutition. This condition requires the use of mouth-washes and gargles, such, for instance, as those containing chlorate of potassium, boric acid, glycerole of tannin, tincture of myrrh, etc. I have often found the milder demulcent fluids made from flaxseed, gum arabic, or slippery-elm bark with water particularly palliative. Of these, none are more relished by the patient than flaxseed tea, sweetened with white sugar and acidulated with lemon-juice. Careful and frequent cleansing of the mouth affords considerable relief. This may be done by the nurse covering her index finger with a soft linen rag, dipping it into a little sage tea or solution of boric acid, and then thoroughly and carefully cleansing the entire buccal cavity. Sometimes it is found more convenient to use some of the mouth-washes mentioned above in the form of spray. All irritating washes, such as caustic solutions of nitrate of silver and the like, should be carefully avoided.

When the eruption assumes the vesicular form, there are always considerable burning and itching of the skin, particularly of the face, hands and forearms. For the purpose of preventing or alleviating these symptoms some ointment or oily substance may be applied. Vaseline containing about 3 per cent. of carbolic acid makes a very useful ointment; or, if the odor of carbolic acid be objectionable, oil of eucalyptus or thymol may be substituted. The preparation which I most frequently employ is one composed of equal parts of lime-water and olive oil, to which I sometimes add an antiseptic, and at other times a little cologne-water. This I have applied very freely with a large camel's-hair brush. When the burning and pain are severe there is perhaps nothing which gives so much relief as cold applications, such as cloths wet with cool water and spread over the face and arms. Curschmann believes that cold and moisture are the most efficient remedies for this condition. He says:[1] "In severe cases the application of iced compresses to the face and hands, or to any parts where the erup-

[1] *Loc. cit.*

tion is abundant, will diminish the severe pain, lessen the swelling and redness of the skin, and make the patient more comfortable."

The development of the eruption in the thick skin of the palms of the hands, tips of the fingers, and soles of the feet not unfrequently gives rise to intense pain. Cold applications or iced compresses may also prove of service, although I think I have seen greater relief follow the prolonged use of lukewarm hand- and foot-baths. The frequent application of flannel cloths wrung out in tolerably hot water, or the use of hot poultices, is often of great service.

Toward the latter part of this stage of variola persistent insomnia and violent delirium often occur. When this condition of the patient is attended by a flushed face and bounding pulse, an ice-bag to the head and a brisk cathartic may be of service. Tartar emetic and sulphate of morphine, in doses of from $\frac{1}{8}$ to $\frac{1}{2}$ grain each, will sometimes produce sleep and quiet the delirium. Large doses of bromide of potassium, or chloral freely diluted, may be given, and repeated if necessary. Some care, however, must be taken not to push these remedies too far, lest the patient lapse into coma or a state of profound prostration.

Occasionally, the delirium is of that violent kind which the older writers styled "*delirium ferox.*" This is accompanied with a wild expression of the countenance, and such a strong tendency to escape from the attendant, or to self-destruction, that too much care cannot be exercised for the safety of both the nurse and the patient. I have known strong and muscular patients while in this state of mind to knock the nurse down, jump out of the window, and run to some secluded place, where they would cunningly secrete themselves. I have also known patients to attempt suicide in various ways while the nurse was temporarily absent. The necessities of the case, therefore, often require the use of some artificial means of restraint. For instance, a wide band of stout webbing or canvas may be placed loosely over the patient's chest and firmly secured to each side of the bed. Smaller bands of the same material may be fastened to each wrist and each ankle, the former being secured to the sides of the bed, and the latter to the foot of the bed, allowing, however, a little motion of the limbs, so that the patient shall not be subjected to painful restraint. In the mean time every effort should be continued to quiet the delirium, and when the patient refuses to swallow, the drugs and nourishment should be administered by the rectum.

It is deemed appropriate to speak of the treatment of hæmorrhagic small-pox under this head, for the peculiar manifestations of this type of the disease become strikingly apparent during the eruptive stage; and, moreover, it is rare for a well-marked case to live beyond the limits of this stage. Treatment is of little avail in this phase of

variola. The remedies usually employed are acids, quinine, ergot, and tincture of chloride of iron; but these, I think, are prescribed more in conformity with general usage than with the expectation of obtaining any real benefit. When hæmorrhage takes place into the various cavities or internal organs of the body, it is recommended that styptics be employed, together with injections of ice-water, or the use of cold compresses or tampons, although it is admitted that the beneficial effect of these agents is very slight. Transfusion has been tried, but has not given very encouraging results.

This type of the disease in varioloid is not quite so significant of danger as in variola. I have seen a few hæmorrhagic cases of varioloid in which the hæmorrhage from internal organs was not very profuse or protracted, although the spots of petechiæ and purpura were well marked, recover under the free use of iron and stimulants. In these cases nourishment was taken freely, prostration was at no time profound, and, as the patients passed favorably through the eruptive stage of the disease, the petechiæ and purpura gradually disappeared and convalescence became established.

The most appropriate diet during the eruptive stage of variola is a liquid or soft diet. It should be easy of digestion and very nutritious, for the patient has yet to pass through a severe ordeal, in which his power of endurance will be tested to the utmost. Such articles as animal broths, milk and eggs may be freely given. Bread may be added to the broths or to the milk, or it may be given in the form of milk-toast. In varioloid, the appetite during this stage is often unaffected; such patients require but little treatment, and may be allowed almost perfect freedom in choice of diet.

The Stage of Suppuration.—As the eruption advances from the papular form, it next becomes vesicular, and then from the admixture of pus-corpuscles the vesicles gradually grow more and more turbid until they become completely purulent; it is now that the disease enters the stage of suppuration. In variola vera this stage begins about the eighth day of the eruption, and continues until the eleventh, twelfth, or thirteenth, when desiccation commences. Its duration, therefore, is from three to five days. It is at this stage of the disease that the eruption attains its greatest development; that the suppurative, irritative, or so-called secondary fever occurs; that the mucous membrane of the mouth, fauces, and larynx becomes most dangerously involved; that the vital forces of the patient are put to the severest test, and his life is placed in the greatest jeopardy. The largest number of deaths by far occur during this period. The indications for treatment are to mitigate the fever, to disinfect the exudation from the skin, to relieve the dangerous throat symptoms, and to resist by every possible means the tendency to death from exhaustion. If the

patient's life can be prolonged through this stage, his chances for recovery increase with each succeeding day.

The febrile reaction, which had abated considerably when the eruption first appeared, now increases to a notable degree, often reaching a greater elevation than existed during the initial stage. In variola confluens the temperature at this period of the disease usually ranges from 103° to 106° Fahr. Various drugs and other means have been employed for the purpose of reducing the intense heat of the body, but none of them have given results entirely satisfactory. Quinine has been recommended, but in order to exert its antithermic properties it must be given in doses of 10 grains, repeated every half hour or hour until 40 grains have been taken. This usually produces effects so unpleasant that I seldom give it as an antipyretic. I use it, however, quite freely as a tonic, and also on account of its favorable action in preventing septicæmia. Some one of the antipyretics of the coal-tar series may occasionally be found useful. There is no doubt about the power of either antipyrine or antifebrin to reduce temperature, but I do not feel sure that the use of these drugs in all cases is unattended by risk. However, when used carefully and in selected cases I do not think the risk is very great. Of the two, I prefer antifebrin. According to my experience, a single dose of 10 grains of this drug to an adult causes, quite uniformly, when the temperature is high, a reduction of four degrees within four hours; but during the following four hours the temperature returns again to where it was before the drug was taken, and sometimes even runs a little higher. During this short respite from intense fever, however, the patient is often able to take a little more nourishment than he would otherwise do, and sometimes enjoys an hour or two of refreshing sleep.

Cool immersion baths, which have been recommended so highly in Germany for reducing high temperature in typhoid fever, have not met with anything like the same favor, even in that country, in the treatment of variola. Aside from the difficulty of getting a patient while in the pustular stage in and out of the baths, the latter, it is said, do not afford much relief. Cold compresses, and cool water squeezed from a sponge over portions of the body, are more easy of application, and are very often serviceable. I have seen patients temporarily benefited in warm weather by covering them with a sheet wrung out in cold water and renewing it every few minutes; but usually this treatment is not well borne for any great length of time, nor is it at all well borne in cold weather. Kaposi, I believe, recommends the application of cloths or compresses moistened with tepid water. The choice between the use of cool or tepid water should depend largely upon the season of the year and the sensations or temperament of the patient. Of course, during this treatment the clinical thermometer should be

used frequently in order to note the reduction of temperature that follows.

The topical applications recommended for the pustular condition of the skin are very numerous. To assuage the pain, burning, and itching, to correct the offensive odor, to guard against septicæmia, and to prevent pitting, are the principal ends aimed at in the selection of these measures. Remedies for the alleviation of the symptoms first mentioned need not be different from those recommended for the same symptoms in the preceding stage of the disease. Indeed, most of the local remedies already described, while they have no power to abridge the course of the eruption, nevertheless are among the best for any or all of the conditions above mentioned.

During the period of suppuration the sensation of itching is much more intolerable than the pain, so that it is almost impossible for the patient to refrain from scratching; and in consequence of scratching, or from other causes, the pustules become ruptured in many localities and their contents discharged. This purulent matter undergoes decomposition wherever it is found, whether in the soiled bedding and clothing or upon the skin of the patient, and consequently gives rise to a highly offensive odor. Remedies are demanded for this condition, not only because of its offensive character, but also because of its liability to lead to septicæmia. Antiseptic washes may be used, such as a solution of boric acid (1 : 20), of carbolic acid (1 : 100), or of corrosive sublimate (1 : 1000). I need hardly say that the latter should be used with some care, particularly about the mouth, nose, and eyes. A very convenient method of using such solutions is in the form of spray. The "sublimate-ether spray" already referred to may be of service at this time. A saturated solution of boric acid in rose-water may be used freely and without any fear of evil consequences, even if it should get into the eyes, nose, or mouth. I frequently employ a 5 per cent. solution of either carbolic acid or Labarraque's liquid, directing that both the patient and the bedding shall be sprayed with this solution every little while.

For attaining the same end, some one of the antiseptic oleaginous preparations recommended for the early stage of the eruption may be continued. I do not know of anything for this purpose to be preferred to the preparation composed of equal parts of olive oil and lime-water and a little carbolic acid or oil of eucalyptus (olive oil and lime-water of each ½ ounce, carbolic acid from ten to fifteen drops). This should be applied with a camel's-hair brush to the face, hands, and forearms two or three times daily. According to some authors, much relief and benefit have followed the use of an ointment made of lard and liquor sodæ chlorinatæ, in the proportion of 1 ounce of the former to 2 drachms of the latter. This is to be freely applied to the face and other much-

involved parts at short intervals. Very excellent results are said to have also followed the use of an unguent composed of 100 parts of cold cream to 4 parts of salicylate of sodium. M. Dujardin-Beaumetz reports that this ointment, in his hands, has not only been successful in destroying the repulsive odor in severe cases of small-pox, but has actually prevented suppuration. His method of using the ointment is to rub it over the face and other parts of the body where the eruption is most abundant; and, in addition, he advises that a powder of 100 parts of talc to 6 parts of salicylate of sodium be dusted over the affected localities. I have sometimes been able to lessen or modify the horrible odor by using as a dusting powder subnitrate of bismuth, boric acid, and, sparingly, iodoform. To either of these, and especially to the latter, talc might be added with advantage. I have not had an opportunity to test the more recent antiseptic, aristol; from the fact that it is odorless it is not improbable that it might prove more satisfactory than iodoform. I should think that from 15 to 20 parts of aristol to 100 parts of talc would make a very useful dusting powder at this stage of small-pox; or possibly it might be more useful in the form of ointment, if mixed with vaseline.

Various, indeed, are the methods which have been recommended for the prevention of pitting in small-pox, and yet I think it can be truly said that no one of them has stood the test of experience. From the unmodified form of the disease disfigurement is as great and as much dreaded at the present time as it was in the days of our ancestors, and it seems probable that this will continue to be the case until some agent is found capable of causing the eruption to abort before it reaches the pustular stage, for the suppurative process at this stage is attended with destruction of derm tissue, and consequently scarring must follow. If any ectrotic measure were reliable, how easy it would be to limit the amount of cutaneous inflammation, to lessen, if not prevent, the so-called secondary fever, and thus obviate the danger from exhaustion. Hence such a measure would serve a double purpose—that of saving life and preventing pitting.

Of the various ectrotic measures recommended, I shall refer only to those which have been spoken of most favorably. Opening the vesicles with a fine needle and evacuating the contents is a method advocated by Rayer. Also evacuation of the vesicles, followed by cauterization by means of a fine-pointed stick of nitrate of silver, has been highly recommended, especially by Velpeau, Bretonneau, and others. The exclusion of light and air from the skin has been thought to prevent pitting. The Egyptians and Arabs sought to accomplish this purpose by covering the face with gold-leaf; and others, more recently, by covering the face with certain dark-colored plasters. Collodion has had its advocates. If useful at all, I think flexible collodion

would be preferable. A solution of gutta-percha in chloroform has been recommended by such men as Stokes, Graves, and Wallace. In using either of the two latter preparations it is advised that they be applied to the face once or twice daily with a camel's-hair brush, and that the applications be commenced while the eruption is still papular or while the vesicles are quite small. These agents are supposed to act by excluding the air and by the mechanical pressure they exert. Tincture of iodine, applied in the same way and at the same period of the eruption, has been highly recommended. Sargent is said to have tested the ectrotic power of this agent in thirty cases of small-pox, the application having been limited to one side of the face. According to the description given of the results, there was not so much swelling where the iodine was applied, the vesicles were flattened, and, while the pitting was not prevented, it was perceptibly diminished. Lemaire and Sansom claim to have used successfully carbolic acid diluted with alcohol. This was applied as soon as the vesicles began to assume a purulent form. Certain merit has been claimed for subnitrate of bismuth and prepared chalk, in equal parts, when applied twice daily in connection with sweet oil. Sulphur ointment (from $1\frac{1}{2}$ to 2 drachms to 1 ounce of lard), rubbed lightly over the affected parts three times daily, has been recommended as useful in preventing suppuration of the vesicles, and thus saving the skin from disfigurement. Mercury has perhaps been more highly praised than any other ectrotic remedy. It has been employed in different forms, both as a plaster and as a wash. M. Briquet was in the habit of using a mask composed of mercurial ointment and sufficient powdered starch to solidify the mass, so that it could be moulded to the various parts of the face. He renewed this application once or twice a day. The French physicians have been very partial to a compound mercurial plaster, known in the French Pharmacopœia as "plaster of Vigo." It has been claimed that if this plaster be applied over affected surfaces before the fifth day of the eruption, the papules either disappear by resolution or change into vesicles or tubercles. According to M. Briquet, the latter change seldom takes place except on the face. It is recommended that the plaster be kept on from eight to twelve days. When removed it is said that only small, hard excrescences are seen, and that these disappear in ten or twelve days without leaving any scars. It is admitted that ptyalism has been known to occur from the use of this plaster. Hence Bennett was led to substitute for the mercurial plaster calamine saturated with olive oil, which he found effective. A solution of corrosive sublimate (1 grain to 6 ounces of distilled water, with 1 drachm of laudanum), applied by means of compresses, is said to have caused the pustules to disappear without much ulcerative action. This application was recommended and used nearly fifty years ago. More recently

Niemeyer has recommended the employment of a solution of about the same strength (corrosive sublimate 1 grain to water 6 ounces). Skoda and Hebra advise that the compresses be dipped in a much stronger solution (grains ij–iv to water ℥vj). Still other measures have been highly lauded for this purpose, but I shall not consume time and space by referring to them.

The results which, in my experience, have followed the use of so-called ectrotic measures have by no means been encouraging. I have never seen any perceptible impression made on the eruption of variola from the application of mercurial ointment. The tincture of iodine, in my hands, has not only failed to do what is claimed for it by others, but, on the contrary, has aggravated the inflammatory action of the skin and increased the suffering of the patient. In the confluent variety of small-pox, where the liability to facial disfigurement is greatest, it is, of course, most unreasonable to talk about evacuating and cauterizing the vesicles. I have tried this plan in the mildly discrete form of the disease, and found that it gave some relief by lessening the sensation of tension that is commonly experienced in the locality of the pustules, but it did not prevent pitting. The application of collodion or a solution of gutta-percha in chloroform cannot, I think, be too strongly condemned. Such applications are objectionable in the first place because they form an impermeable coating, thus preventing exhalation from the skin, which adds to the discomfort of the patient. In the second place, they are objectionable because they render the surface of the skin over which they are applied so dense and unyielding as to cause an increase of pain in that part during the growth of the vesicles. In other words, the pain is increased by these agents on the same principle that it is rendered more intense in the soles of the feet and tips of the fingers when the eruption is developing there, where the skin is naturally hard and unyielding. Aside from all this, I would condemn these agents because they have utterly failed in my hands to accomplish the purpose for which they were used. This is not only true of collodion and gutta-percha, but of all other measures which I have employed. Hence, I feel about this matter of disfigurement very much as Gregory did when he wrote:[1] "There is no peculiar method which can be devised for the prevention of pits and scars. The masks and ointments formerly in use for that purpose, and so highly vaunted, are, in reality, more hurtful than beneficial. The application of a little cold cream to the hardened scabs is all that can be recommended."

The throat symptoms which appeared in the preceding stage of the disease now usually become greatly aggravated, especially in the confluent form of variola, where the eruption upon the mucous membrane of the mouth and fauces is generally also confluent. It is therefore

[1] *Loc. cit.*

necessary to continue the mouth-washes, gargles, and sprays previously recommended. It must be remembered that the eruption never presents itself on the mucous membrane so distinctly vesicular or pustular as on the skin, but assumes a pseudo-membranous or diphtheritic appearance. Hence the buccal surface and fauces often look as if they were covered by the true diphtheritic membrane. This condition may extend to the posterior nares, pharynx, and larynx, causing pain, fœtid breath, difficulty in swallowing, and sometimes all the symptoms of diphtheritic croup. The former symptoms may be benefited by using freely a solution of chlorate of potassium, alum, or borax as a mouth-wash or gargle. Curschmann recommends a weak solution of liquor ferri chloridi. When there is much fœtor from these parts some antiseptic, such as carbolic acid, permanganate of potassium, and the like, should be added to the mouth-wash or gargle. I have found diluted chlorine-water to answer a good purpose. If it be impossible for the patient to rinse out the mouth or use the gargle, the nurse should thoroughly cleanse the mouth and throat in the manner already described, and then apply to those parts an astringent or antiseptic spray. The nasal cavities should also receive similar treatment.

The pain in the throat and the difficulty of swallowing are often greatly benefited by having the patient hold in his mouth small pieces of ice and allowing these to dissolve slowly. Mucilaginous drinks, either warm or cold, are always grateful to the palate. As already stated, there is no drink of this kind more relished by the patient and more palliative than flaxseed tea containing lemon-juice. When the pain and swelling in and about the throat are intense, the application of the ice-bag externally is sometimes beneficial. On the contrary, some patients are benefited more by hot applications, such as poultices. Should acute œdema of the glottis or of the ary-epiglottic fold soccur, an emetic may be given if the patient is not too weak to bear its action, or local scarification may be practised.

When the eruption is intensely confluent on the mucous membrane of the fauces and larynx, there is not only swelling of these parts, but the epithelial layer degenerates into a veritable false membrane, which resembles the pseudo-membrane of croup, and gives rise to all the distressing symptoms peculiar to that disease. The local treatment for this condition need not differ greatly from that usually employed in true diphtheria. In addition to some of the local remedies already recommended, inhalations of steam from boiling water or from water and vinegar mixed may be of service; likewise, the vapor from slaking lime is sometimes useful. Lime-water in the form of spray has been recommended. Also spray-inhalations of a solution of lactic acid in water (20 grains to 1 ounce) may be tried. I have seen in true diphtheria much benefit follow the use of peroxide of hydrogen, applied either in the

form of spray or with a camel's-hair brush. Possibly it might prove of service for this condition in small-pox. When suffocation threatens, either from this cause or from acute œdema of the glottis, tracheotomy offers the best if not the only chance for recovery.

The eyes often require attention at this period of small-pox. Ophthalmia in its more serious and destructive form, however, usually does not appear before the commencement of the retrogressive stage of the eruption, and sometimes even later. At this (the suppurative) period there is always a good deal of inflammation of the lids and lachrymal apparatus; the lids, indeed, are often so much swollen that they cannot be opened, and pus may be seen oozing from their margins. The nurse should be instructed to wipe away the pus as fast as it forms, and to apply to the parts frequently a saturated solution of boric acid and rose-water. Compresses wet with either warm or cold water may be kept constantly applied.

It is at this stage of small-pox that the vital forces of the patient are put to the severest possible test. The prostrating effects of the vast irritation and profuse suppuration from the innumerable pustules must necessarily be very great. Watson has estimated the quantity of pus thus generated as amounting to quarts. A drain upon the blood so extraordinary as this demands that the strength of the patient should be vigorously supported; otherwise evidence of exhaustion soon becomes apparent. The first evidence of flagging of the vital powers is often seen in the subsidence of the redness and swelling of the face and hands: the skin becomes pale, the pustules present a shrunk or collapsed appearance, and the pulse grows rapid and feeble. Other symptoms indicative of exhaustion are subsultus tendinum, general tremors, a dry tongue, and delirium. These are always indications for the most liberal use of stimulants and nutritious and easily-assimilated food. It is wiser, however, not to wait until the vital energies begin to flag before resorting to the supporting plan of treatment. As the patient approaches the suppurative stage of variola his strength should be preserved by constant reinforcement, so as to enable him better to encounter the struggle which is before him. Contrary to what was formerly believed, the sthenic condition in this disease is not to be feared; rather is it desirable.

In a pamphlet entitled *Variola; its Nature and Treatment*, prepared in 1856 and published a few years later by the late Dr. Andrew Nebinger of Philadelphia, the supporting plan of treatment in this disease is very earnestly advocated. The author severely criticises the practice, then largely in vogue, of confining the patient to a diet composed of gruel, toast-water, and panada, and recommends instead the most liberal use of stimulants, milk, and eggs. He strongly and wisely maintains that the constant aim of treatment should be to supply nutriment in sufficient

quantity to compensate the system for the loss it sustains through the suppurative process. This method of treatment he not inappropriately styles "compensative nutritive treatment." He advises that supporting measures shall be commenced as soon as the eruption assumes the vesicular character. In carrying out this treatment he has found no diet so useful and grateful to the patient, nor any which gives as little inconvenience in swallowing, as a combination of eggs, milk, whiskey, sugar, and ice. These he gives in the proportion of one egg well beaten, half a pint of milk, from a half to one ounce of good whiskey, and sugar and ice in quantities suited to the taste and desire of the individual, repeating this potion every two or three hours. He says: "I have frequently had patients take as many as twelve eggs, three quarts of good new milk, and eight ounces of whiskey daily for several consecutive days; and yet, with all this supporting and stimulating diet, this most excellent proteid or highly nitrogenized food, these poor fellows barely escaped sinking into the grave, some of them having had that peculiar feebleness and tremor which is always the unmistakable evidence of a breaking up of the vital forces—the threatenings of dissolution." He concludes this paragraph with expressions of positive conviction that many of his cases which recovered would have died under the old method of treatment.

There is no doubt that the treatment at this stage of variola should be of a highly supporting character. All authors agree to this. But, unfortunately, the majority fix the appearance of symptoms of exhaustion as the proper time for the commencement of supporting measures. This is often too late. Undoubtedly Nebinger is right in anticipating these symptoms by the early employment of stimulants and nutrients. It is my practice to commence with these measures at the beginning of the suppurative stage, or earlier if deemed necessary. The method of their employment is about as follows: To an adult suffering from the confluent variety of the disease I direct that there shall be given every twenty-four hours from 2 to 3 quarts of unskimmed milk, two to four eggs, and 6 to 12 ounces of whiskey; the latter being given usually in the form of milk-punch. The eggs should be well beaten and drank with the milk (a little salt being added), or they may be given in the form of egg-nog. It is important that the nutriment be given at short intervals, since patients can seldom take a large quantity at one time. It is also important that the stimulants and nutrients should be faithfully continued during the night, for many a patient, when greatly prostrated, has sunk beyond recovery during that time, especially between midnight and morning, for the want of these measures.

In selecting the diet and stimulants we should, of course, take into consideration the condition of the patient's stomach. If that organ should be very weak or disinclined to receive in sufficient quantity the

nutritive material just referred to, or if there should be a great repugnance to milk, as is sometimes the case, such articles as bouillon with eggs, a well-prepared beef-tea, nutritious broths, and liberal amounts of wine should be given instead. As a stimulant for patients in profound prostration Curschmann says a very good preparation is the Stokes cognac mixture :

℞. Cognac opt.,
Aquæ dest., āā. fʒxv ;
Vitelli ovi, No. 1 ;
Syrupi, fʒvj.—M.
Sig. A table-spoonful every two or three hours.

I would suggest that this preparation might prove more efficacious if repeated more frequently.

In the way of drugs, quinine in tonic doses—2 grains every three or four hours—is, I think, of service at this stage of the disease. Digitalis seems to be indicated at times to steady the action of the heart, but if there be evidence of collapse or cardiac failure, carbonate of ammonium should be given in addition to the alcoholic stimulants. When the patient is very restless or suffers from insomnia, which not infrequently happens, anodynes may be cautiously given, either by the mouth or rectum, or hypodermically if deemed preferable. The delirium which is often most prominent during this stage should be treated in the manner already described. No more medicine should be given than is absolutely necessary, for the less the stomach is taxed with the ingestion of drugs, and the more entirely it is given over to the work of sustaining the vital forces and nutrition of the body, the better will be the chances for recovery.

The question of administering cathartics during this stage of small-pox is one of some importance. According to Gregory, one of the most remarkable disputes which ever occurred in medicine was on this very question. The Arabians strongly opposed their use ; Sydenham never regarded them with any favor ; Morton inveighed bitterly against their employment ; but Friend, assuming the position of a reformer, advocated their free use, especially during the period of suppurative fever. About this time, it is said, a young nobleman fell ill with confluent small-pox, and Friend, together with two physicians who held to the opposite side of the question, were called to treat him, and, in the language of Gregory,[1] "The arguments in the consulting-room were long and stormy. The patient died, in spite of the purgatives which Dr. Friend's pertinacity had at length induced his colleagues to agree to. A paper war succeeded, and from words the parties came

[1] *Loc. cit.*

to blows. In June, 1719, Dr. Mead and Dr. Woodward met in Cheapside, drew their swords, and, after a few passes, Mead came off victorious. This display effectually settled the dispute, and purgatives are now as freely employed in the secondary fever of small-pox as in ague or typhus. They are of the greatest service when the skin is hot and dry, when a scarlatinal rash covers the body, or innumerable abscesses give evidence of the excited state of the cutaneous vessels."

I cannot agree with Gregory and others who recommend purgatives at this stage of the disease. My experience leads me to believe that the use of such agents is often attended with great risk. They are not only exhausting in their effects, but they temporarily interfere with the processes of digestion and nutrition; and such interference is often sufficient, especially when the life of the patient is, as it were, hanging in the balance, to decide the issues of the case unfavorably. When the bowels are constipated a mild laxative may be administered, or, what is preferable, a simple enema may be given.

The Stage of Retrogression, or Stadium Exsiccationis.—The stage of retrogression is characterized by drying of the pustules, lessening of the pain, diminishing of the swelling and redness of the skin and also of the involved mucous membrane. The eyes again open, the nasal passages become more patulous, swallowing is less difficult, and the countenance, in favorable cases, assumes a brighter and more hopeful appearance. This stage, in unmodified small-pox, usually begins from the eleventh to the thirteenth day of the eruption, and runs very gradually into the stage of convalescence. In cases somewhat modified it commences a little earlier. During the greater part of this period the same general treatment recommended for the preceding stage should be continued. When, however, the patient shows well-marked indications of improvement, the quantity of stimulants may be gradually diminished, and such articles as corn starch, milk-toast, soft-boiled eggs, cup custard, and the like may be added to the diet. Quinine and some ferruginous preparation, especially the tincture of the chloride of iron, are particularly valuable at this time.

The treatment required for the skin, especially during the early part of this stage, does not differ from that already described. If the peculiar offensive odor has not been noticed before, it is quite certain to appear and become very prominent now. It arises from an exudation of a yellowish, viscid fluid upon the surface of the pustules, and forms a rough coating. The antiseptic washes, ointments, or powders should of course be continued as long as this condition exists. These remedies, particularly the ointments, are also useful to quiet the intense itching which at this period takes the place of the pain.

COMPLICATIONS.—Complications in small-pox are very numerous,

and this is the stage of the disease in which they are peculiarly liable to occur. Of these, abscesses and more or less extensive phlegmonous processes are most common. The abscesses may be treated by warm fomentations, and they should be opened as soon as fluctuation is detected, especially when they occur in the scalp, as burrowing of the pus often takes place there very extensively. The washing out of the cavities of the abscesses with an antiseptic fluid serves a useful purpose. The phlegmonous processes may be combated by the usual local antiphlogistic remedies, such as cold compresses or lead-water and laudanum. The system should be well supported at the same time. Phlegmonous erysipelas is a very dangerous complication. Ordinary erysipelas is much more common and far less fatal. These affections are to be met by the usual remedies. Gangrene of the skin almost never occurs, except occasionally in the scrotum. I have seen a few cases of the latter, but have never known one to recover. The local use of antiseptic agents and a vigorously supporting internal treatment are perhaps the best that can be done for this complication. It is not advisable to attempt to remove the gangrenous parts until nature has effected their separation.

Corneal ulcer is not an uncommon complication. It often begins at the early part of this stage, sometimes a little later, and it may begin as late as the period of convalescence. The more destructive forms of this affection usually begin at the former period. It is not, as some suppose, the result of a variolous pustule on the cornea. I believe the eye possesses complete immunity from the eruption of small-pox. The first evidence of corneal ulcer is a little pain and slight redness in a certain part of the eye, usually at the margin of the cornea, and very soon an ulcer is formed. The ulcerative process is often very rapid—so rapid, indeed, as to destroy the entire cornea within forty-eight hours. At this stage of small-pox the eyes should be kept scrupulously clean, and as a precautionary measure a solution of boric acid (10 to 20 grains to rose-water 1 ounce) may be instilled in them once or twice daily. They should be examined frequently, and as soon as the ulcer appears I would recommend the use of the solid stick of nitrate of silver, which should be brought to a fine point and applied very delicately. Atropine in solution should then be instilled in the eye, and cold compresses applied. In spite of treatment, however, the ulcerative action often continues, destroying not only the cornea, but giving rise to perforation, iritis, and even suppuration of the globe. Anodynes may be required to quiet the pain, and the diet should be liberal.

The pleura and lungs occasionally suffer at this period of the disease. While an ordinary inflammation may occur in these parts, yet they seem peculiarly liable to a form of inflammation which, in the lungs, rapidly advances to purulent infiltration, and, in the pleura, to empyema. In

treating these affections the fact must not be lost sight of that the patient is already greatly exhausted by the primary disease; hence the treatment should be principally of a supporting character.

Inflammation of the joints is by no means the rarest of the concomitant affections which appear at this stage of small-pox. Like all other inflammatory processes in this disease, it strongly tends to suppurative action. Not infrequently, indeed, it seems to begin as a purulent synovitis. According to my experience, the elbow-joint suffers more frequently than any other. In the treatment of this affection no deviation is required from the ordinary surgical practice in such cases in general. The pus should be evacuated and the parts treated antiseptically. Recovery from this complication is very rare indeed. When there is simply painful swelling of the joints, accompanied with slight inflammation and effusion of serum, good results may follow the use of ordinary local antiphlogistic remedies.

Septicæmia and pyæmia occasionally occur at the end of the suppurative period. When we consider the extent of cutaneous surface which is so freely bathed in pus and ichorous fluid at this time, it is, I think, surprising that this complication does not occur more frequently. The treatment here need not differ materially from that generally recommended for these affections occurring under other circumstances. As might be expected, the most approved treatment is not followed by very satisfactory results.

Changes in the abdominal viscera sometimes occur as complications. Of these, intestinal derangement is most frequent. This generally assumes the form of persistent diarrhœa. So common, indeed, is this disturbance of the intestines that Sydenham speaks of it as "*variola dysenterica.*" The ordinary remedies, such as opium, the astringent tinctures, and chalk mixture, will, in the majority of cases, succeed in quieting the bowels. Subnitrate of bismuth is also very efficient. Often, however, these remedies require to be given in full doses and frequently repeated.

Complications in the form of disease in some part of the nervous system are by no means rare at this stage of variola. We may also meet with suppurative otitis, caries of the bones of the ear, ulceration of the mucous membrane of the nose, bronchitis, and various other affections. All of these diseases should, of course, be met by the most approved medical and surgical treatment.

Convalescence.—The duration of the period of convalescence from this disease varies with the severity of the attack. In uncomplicated variola vera convalescence is usually completed in from four to six weeks after the earliest manifestation of the disease, making, therefore, the convalescent period itself of from two to four weeks' duration. When recovery takes place from the severer forms of small-pox, convalescence

is not only slow, but is often interrupted by the occurrence of various sequelæ, among which furuncles and a succession of small abscesses are most common. Their treatment requires the application of hot fomentations until suppuration is established, and then the free use of the lancet. When these furuncular processes are very numerous and continue to be reproduced for a long time, good results may be obtained from the administration of Fowler's solution of arsenic. This constant recurrence of boils constitutes, according to some writers, the "furuncular diathesis," and indicates a depraved condition of the blood; more especially is this true when these suppurative processes assume the form of deep-seated abscesses. The occurrence of these sequelæ, therefore, calls for the use of tonics, such as quinine and iron; for stimulants, especially the malt liquors; and for a liberal and nutritious diet.

While erysipelas may occur in the preceding stage of the disease, it is much oftener met with during convalescence. It is generally not very fatal at this time, but yields quite readily to the ordinary treatment, such as the internal administration of 30 drops of tincture of chloride of iron every three hours, and external applications of diluted lead-water, with the addition of a little laudanum. Other approved methods of treatment would doubtless prove equally successful.

Aphasia is sometimes seen as a sequela of small-pox. I myself have met with two or three such cases. This symptom evidently indicates that a certain part of the brain has sustained some damage from the variolous process. It may be the result of a circumscribed encephalitis. According to my experience, recovery from this sequela is very slow; indeed, several months may elapse before the power of speech returns to anything like its normal condition. As to treatment, tonics are certainly indicated. For the purpose of aiding in the removal, by absorption, of any inflammatory products that may exist in the brain, iodide of potassium or iodide of sodium may be given.

Another sequela of nervous origin sometimes met with is paralysis. This symptom, I think, is more frequently seen in the extremities, especially the lower extremities. The source of this trouble is believed to be in the spinal cord. According to Curschmann, Westphal has shown that the paralysis is often due to numerous circumscribed foci of inflammation in the gray and white matter of the cord. Assuming this to be the cause of the malady, it is of course too late to treat at this time the acute inflammatory attack, for that stage has passed, but rather have we to deal now with its results. The aim of the treatment should therefore be to restore to a normal condition the diseased foci in the cord by favoring resolution of the inflammatory changes. For this purpose ergotin, belladonna, or iodide of potassium in appropriate doses may be given, while externally we may employ derivatives, such, for instance, as painting the length of the spine with tincture of iodine,

etc. When improvement begins, it may be hastened by the use of the galvanic current.

The diseased area within the spinal cord may sometimes be favorably influenced through general stimulation of the tissue-changes and of nutrition; hence any agent that tends to increase this function of the body is of service. We should therefore give tonics, such as iron, quinine, and strychnine, and even cod-liver oil when indicated; we should direct the patient to bathe frequently, to live as much as possible in the open air—preferably in the air of mountains and woods; in short, we should direct him to make use of every possible means that will increase his appetite and strengthen his digestion, while at the same time he should be supplied with a strong and abundant diet.

Œdema of the feet and legs is not infrequently seen after severe attacks of small-pox. In such cases there is always great exhaustion, and the patient is generally anæmic. The latter condition is doubtless the cause of the œdema in the great majority of cases. If there be chronic nephritis, the dropsy may be due to that disease; but nephritis is a rare sequela of small-pox. In the treatment of the anæmic cases iron, in some form, should be administered, and a roller bandage applied to the feet and legs. If the kidneys be diseased, of course they should receive appropriate treatment.

During convalescence from the severer forms of small-pox, night-sweats are often profuse and exhausting. The mineral acids seem to be indicated for this condition, or belladonna or atropine may be given. The latter often proves very efficacious.

Decrustation, when slow in taking place, may be hastened by free inunctions of glycerin or cosmoline, and by the daily use of warm baths. After the scabs have fallen off, deep and unsightly scars remain in the cutis vera, but we are powerless to remedy that condition. But when, in addition to the scars, warty nodules remain on the face, their removal may be hastened by painting them once or twice a day with tincture of iodine.

When convalescence is not interrupted by the occurrence of sequelæ, no internal medicaments other than ordinary tonics are required. The patient's appetite is generally very good—often, indeed, voracious—and he rapidly regains both flesh and strength.

TYPHOID FEVER.

By FREDERICK P. HENRY, A. M., M. D.

A FULL discussion of the treatment of a disease, especially if it be of protracted course, must involve the questions of prophylaxis, complications, and sequelæ, bearing in mind the fact that a complication is to be distinguished from an intercurrent affection. The latter is something accidental—*i. e.* no more liable to happen to a patient affected with a given disease than to one not so affected—while a complication is a disease or a process secondary to, and more or less dependent upon, another.

PROPHYLAXIS.

Under this head might properly be included all that concerns the treatment of typhoid fever, for the object of prophylaxis is not only to confer immunity from infection, but to prevent complications; and any method of treatment which surely accomplishes the latter indication leaves little or nothing to be desired. For example, certain tissue-degenerations in typhoid fever are generally believed to depend upon long-continued pyrexia, and, in the opinion of many therapeutists, if these are prevented the disease will almost invariably pursue a benign course. An antipyretic or refrigerant treatment is, from this point of view, curative, because it is prophylactic. It is usual, however, to limit the domain of prophylaxis to the prevention of infection; and this custom, although one which would be "more honored in the breach," will not be departed from in this article.

It is unnecessary to enter into any detailed argument to prove the infectious nature of typhoid fever. The fact of infection is generally admitted, and necessarily implies an infecting agent. The researches of Eberth and Klebs have demonstrated the latter to be a species of bacillus distinguished by certain peculiarities, chiefly of staining, from the *Bacillus coli communis* and other micro-organisms indigenous to the intestinal canal. This bacillus is found occupying the site of every lesion of typhoid fever—in the enlarged and ulcerated plaques of Peyer; in the tumefied mesenteric glands; in the spleen, the liver, the kidneys; in the ulcerations of bed-sores; and, finally, in the blood itself. It is true that the crucial test of the specific nature of this

organism—its successful inoculation in animals—is as yet wanting, but this objection may be met by the statement that we are acquainted with no animal, unless it be the horse, which is susceptible to typhoid infection. The latter animal is subject to a disease attended with marked congestion of the intestinal mucous membrane, and sometimes even with ulceration of Peyer's patches; but the enlargement of these follicles is never so great as in the typhoid fever of man, neither does it present the well-known appearance of "medullary infiltration." The general course of the disease, especially as regards the nervous and intestinal symptoms, is not unlike that of typhoid fever, but the affection cannot be regarded as identical until the bacillus of Eberth has been shown to be common to both.

The same criticism applies to the morbid process produced in the rabbit and guinea-pig by the inoculation of fluids derived from the lesions of typhoid fever. In these animals the alterations of Peyer's patches so characteristic of typhoid fever may be produced by such inoculations, but the same results follow the inoculation of various species of bacteria, and are, in fact, nothing more than one of the lesions of septicæmia experimentally induced.

For the complete demonstration of the specific nature of the typhoid bacillus we must therefore await the results of further research, possibly until an animal is found which does not possess immunity against what may be called spontaneous as distinguished from experimental typhoid fever. In the mean time, however, the evidence of the specific nature of the organism in question is convincing to those best able to form an opinion in such matters. Among the facts of which this evidence is composed may be mentioned the presence of the bacillus in the system during the febrile period, and its disappearance during convalescence, as well as its presence in drinking-water in many epidemics of the disease.

A question of great interest from a prophylactic point of view is whether the bacillus normally existing in the colon, the *Bacillus coli communis*, may outside the body become converted into the specific bacillus of Eberth. This question is by no means chimerical, and has already been discussed by the author in another publication.[1] I cannot give a better presentation of the facts in its favor than by quoting the article to which I refer:

"Probably the bacteriological question of greatest practical interest is whether an organism may be benign in one locality and malignant in another; or, to state it differently, whether the property of infection is an adventitious one, depending upon the soil in which the organism grows, or inherent in its substance. An attempt to solve this problem, in so far as it relates to the typhoid bacillus, has been made by Rodet

[1] *The Medical News*, March 22, 1890.

and Roux,[1] whose researches have led them to conclude that the bacillus of Eberth is nothing more than a modification of the *Bacillus coli communis*. The facts upon which they base this opinion are of two kinds: In the first place, they made cultures of the blood of the spleen and of the fæcal matters of two typhoid patients, and found that the former produced nothing but the bacillus of Eberth, and the latter little else than the *Bacillus coli communis*, the bacillus of Escherich. In the second place, according to Rodet and Roux, the optical points of resemblance between the two bacilli are greater than those of difference, and are such as to warrant the belief that the one is a modification of the other. Carefully-conducted cultures in gelatin, potato, and bouillon exhibit similar microscopic appearances, while the limits of temperature within which the two organisms can be cultivated are almost identical, being somewhat higher (46.5° C.) in the case of the bacillus coli than in that of Eberth's bacillus (45° C.)."

Under the microscope the differences are more marked, the bacilli coli being of almost uniform length, homogeneous in structure, slightly mobile, and staining readily, while the bacilli of Eberth are of unequal length and thickness, are more mobile, and stain less readily than the bacilli coli. The structure of their protoplasm also is evidently not homogeneous.

If, however, the bacillus coli be cultivated at a temperature of 44° to 46° C., it undergoes such changes as to cause it to bear a remarkable resemblance to the typhoid bacillus. The rods become of unequal length; their protoplasm ceases to be homogeneous, and presents a series of readily-staining condensations, separated by clear intervals; in a word, the results of numerous observations of the sort show that while the type of Eberth's bacillus is relatively fixed, that of the bacillus coli is remarkably unstable, and by a series of transitions approaches, and even becomes identical with, the former.

The typhoid bacillus is, according to the authors quoted, the bacillus coli in a state of degeneration. This is shown by the fact that the former is less able to resist heat than the latter, Eberth's bacillus being destroyed by a temperature (80° C.) which is supported by the bacillus coli. This is far from saying that the bacillus which causes enteric fever is in a state of degeneration at the time of infection. The bacillus coli becomes virulent without any notable change in its appearances and other characters, and it is in the interior of the organism, especially in the spleen, that it assumes the features of Eberth's bacillus. The latter are the result of the destructive forces of the body.

The practical conclusions from these researches are twofold:

1. Water contaminated with fæcal matter, not necessarily typhoidal, may give rise to enteric fever.

[1] *Comptes-Rendus hebdomadaires des Séances de la Soc. de Biologie*, Feb. 21, 1890.

2. The tolerance of the organism for the bacillus coli shows that the latter acquires its virulent features outside of the body.

It is to be hoped that the experiments of Rodet and Roux will be thoroughly investigated. Certainly, none more practical could engage the attention of bacteriologists. If confirmed, the term "pythogenic fever," introduced many years ago by Murchison, may yet be generally accepted as the proper one for the disease which is now somewhat vaguely styled "typhoid" or "enteric fever."

I have given the foregoing details on account of what appears to me their marked bearing upon the prophylaxis of typhoid fever. In the present state of our knowledge of this subject it seems to me imperative not only to disinfect the excreta of typhoid-fever patients, but also those of the healthy, or at least so to dispose of them as to make it impossible for them to contaminate the air we breathe or the water we drink.

The chief—in the opinion of many practical physicians the only—source of the typhoid infection is the excrement of those affected with typhoid fever. There are few who believe, with Laveran,[1] in the direct transmission of typhoid fever from patient to patient. The experience of most hospital physicians coincides with that of Andral, who never observed an instance of the sort. In justice to Laveran, it must be remarked that with reference to this point he draws a distinction between civil and military hospitals. In the former, as he justly observes, many of the patients have either passed the period of greatest susceptibility to the disease or have already suffered from it. In military hospitals, on the other hand, the patients are young men, mostly from the country,[2] in other words, far removed from the centres of epidemics, and therefore peculiarly susceptible to the typhoid infection. Among such patients Laveran, up to 1884, had observed twenty-eight cases of typhoid fever originating in hospital wards, and, as he believes, by direct transmission from patient to patient.

Dujardin-Beaumetz is still more positive in the expression of his belief in the direct contagion of typhoid fever, and speaks of it as of daily occurrence.[3]

Conveyance of Typhoid Infection by Water.—The ordinary vehicles of the typhoid infecting agent are water, air, the soiled linen of typhoid patients, and the hands of their nurses. In the great majority of cases—according to Brouardel, ninety-nine times in one hundred—the disease is conveyed by drinking-water. The most interesting and convincing examples of the latter mode of propagation are

[1] *Bullétin et Mémoires de la Soc. méd. des Hôpitaux de Paris*, tom i. ser. iii., 1884, p. 75.

[2] This statement applies to the military hospitals of France, in which Laveran's observations were made.

[3] "Il ne faudrait pas cependant être exclusif et rejeter la contagion directe dont nous voyons journellement des exemples dans nos hôpitaux, soit dans le personnel, soit parmi les élèves" (*Leçons de Clinique thérapeutique*, t. iii.).

furnished by cities which obtain their water from more than one source. Such a city is Geneva, the water-supply of which is derived from the Rhone and the Arve. The former issues from the Lake of Geneva in two branches, of which one, the left, was dammed for hydraulic purposes in February, 1884, the effect being to divert the outlet of the lake entirely into the right branch, from which drinking-water for the city was pumped. On January 28th a portion of the lake, not far from its outlet and near the openings of certain sewers, was dredged. This was followed about twenty days later by a severe epidemic of typhoid fever, the number of cases rising from 18 in January to 965 in March. The dredging ceased on March 4th, and fifteen days later —*i. e.* at the end of a period equal to the incubation stage of typhoid fever—the epidemic began to decline. It did not definitely cease, however, until the month of August, when a conduit was carried into the lake far from the sources of pollution, and became the sole source of water-supply so far as the lake was concerned. The epidemic was closely studied, and among other facts it was ascertained that in the quarter of the city (Quartier des Eaux-vives) adjoining the portion of the lake which was dredged there had been, during the latter months of 1883, 7 cases of typhoid fever. During the epidemic not a single case of typhoid fever occurred among those who were supplied with water from the Arve.

The following experiment, described by Chantemesse and Vidal,[1] is of decided interest in connection with the origin of this epidemic:

In a flask is placed a small quantity of sand and earth. It is then filled with water sterilized by boiling, and, after cooling, cultures of the typhoid bacillus are added. For a few weeks after this procedure cultures of the bacillus may be readily obtained from the upper layers of the water. Gradually, however, the depth from which these are procured increases, until at the end of two months, the flask having remained perfectly quiet, the water is entirely free from germs. If it be now carefully decanted and fresh water poured in, so as to stir up the sediment of sand and earth, it will be found teeming with bacilli. Such experiments and such epidemics as that of Geneva in 1884 might lead one to suggest that the Scotch proverb, "Let sleeping dogs lie," be paraphrased so as to read, "Let sleeping microbes lie."

Paris is another city the water-supply of which is derived from more than one source; in fact, it is remarkable for the number of the streams which it lays under contribution for this purpose. Unfortunately, they are not of equal purity. The Dhuys and the Vanne give the best water, but occasionally have to be supplemented by the Seine, the Marne, and the canal of Ourcq, the three latter being polluted by sewage before their entrance into the city. This fact is so well known

[1] *Gazette des Hôpitaux*, No. 26, 1887.

that official notice is always given before turning on the water from the last-named sources in any district of the city. The invariable result of such an addition to the ordinary water-supply is a marked increase of the cases of typhoid fever. For example: About July 20, 1886, the river-water (Seine and Marne) had to be levied on to supplement the deficiencies of the Dhuys and Vanne. From the 18th to the 24th about 40 cases of typhoid fever were admitted into the various hospitals; from the 1st to the 7th of August 150 were admitted. In January, 1887, the river-water was again turned on, and the number of admissions augmented from 30 in January, to 95 in March, the supply of river-water having been continued during that interval. In June of the same year the use of river-water ran up the number of weekly admissions from 20 in the last-named month to 165 in August.

The last instance of the conveyance of typhoid fever by drinking-water to which I shall allude is, in many respects, the most remarkable on record, and chiefly because of the numbers attacked—1200 out of a population of 8000—and the accuracy with which the origin of the epidemic was traced to the dejections of a single patient. The town of Plymouth, in Luzerne county, Pennsylvania, was the seat of the epidemic, which was carefully investigated by Drs. French and Shakespeare,[1] who were appointed for this purpose by the mayor of Philadelphia on May 7, 1885. Omitting many interesting details, I will merely state that the town of Plymouth is supplied with water from three sources: 1, a mountain-stream, in the course of which are four reservoirs formed by dams; 2, the Susquehanna River; 3, a "great number" of wells. It was positively demonstrated that the victims of the disease were to be found solely among those whose drinking-water was obtained from the first-mentioned source. The reason of this selection is fully set forth in the following extract from the report of Drs. French and Shakespeare: "It may be well, however, to state here that it has been shown that the three lower reservoirs on the mountain-stream which nine months of the year supplies Plymouth with water were on the 20th of March nearly empty; that in a dwelling on the sloping bank of the stream, a little distance above the third reservoir, and within seventy feet of the bed of the brook, there was a case of typhoid fever, running its course through January, February, and March; that during most of this period the ground was frozen and covered with snow; that during the illness of this patient the evacuations passed in the night were habitually carried out and thrown upon the snow toward the stream, *no attempt at disinfection having been made;* that about the 25th of March a thaw began and was followed by slight rains; that on the 26th of March the superintendent of the

[1] *Report on the Epidemic of Typhoid Fever at Plymouth;* also *New York Medical Journal*, June 13, 1885.

Plymouth Water Company inspected the reservoirs, and, finding the two upper ones full, that same evening caused the water of the third reservoir to be let down directly to the lowest reservoir; that on the evening of this day pumping from the Susquehanna River ceased, and the town was again entirely supplied from the mountain-stream; that thus nearly three months' accumulation of infectious typhoid-fever dejecta was suddenly washed with the melting snow into the brook, and rapidly reached the lower reservoir, and was thence distributed through the pipes and hydrants of the Plymouth Water Company; that fifteen days after this date the epidemic began; that no other source of unusual pollution of the mountain-water was discovered."

Facts similar to the above might be greatly multiplied, but those I have selected from the epidemics of Geneva, Paris, and Plymouth will serve as types of the conveyance of typhoid infection by water, and amply illustrate the importance of prophylaxis in this direction. To quote again from the report of French and Shakespeare: "Had the infectious poison breeding in the evacuations of that one fever patient up near the top of Shawnee Mountain been destroyed by proper disinfectants or otherwise, that community of eight thousand people living in the valley would not have been shrouded with the pall of death or had its industries so blighted."

Conveyance of Typhoid Infection by Milk.—Next in activity to water as a carrier of the typhoid infection is milk. In most of the epidemics that have been traced to this source the milk had been diluted, or the cans containing it cleansed with water containing the germs of typhoid fever. In view, however, of the remarkable absorbent power of this fluid, as indicated by the readiness with which the taste and odor of contiguous substances are imparted to it, the question arises whether the typhoid virus may not gain access to milk without direct admixture in the ordinary sense of this word. The question may, in my opinion, be answered in the affirmative. In other words, milk may become affected not only by impure water, but by impure air. The fact is so notorious and so self-evident that milk may convey typhoid fever by being mingled with water containing its germs that I will not give any details of the numerous epidemics that have been caused in this manner. To enter into an argument to prove this mode of infection would be equivalent to arguing that milk is not destructive to the typhoid germs—a fact disputed by no one. I will merely refer to an epidemic in Carlisle, England,[1] in which an epidemic was traced to a dairy where a death from typhoid fever occurred on March 2, 1887, the water-supply being in no wise in fault. From this date until May 15th "twenty cases of typhoid fever were brought under observation, and through careful

[1] William Brown, *Sanitary Record*, July 15, 1887.

inquiry it was ascertained that, with one doubtful exception, all the affected individuals had derived their milk-supply from the Metcalfe street vendor, and had partaken of the milk in such a manner and at such times as were consistent with the theory of their having derived their infection from polluted milk. The water used at this dairy was that supplied by the city, and the supply-pipe was carefully examined by an expert and found to be quite tight and free from leakage." Cultivation-experiments were made with the water, which was found to be free from pathogenic organisms. The water thus being shown to be free from the typhoid poison, the mode of infection must have been different from that of the other principal milk-epidemics with which we are acquainted. "Presupposing the typhoid poison with which the milk became contaminated had its source in the sick inmates, several modes through which milk-infection may have taken place at this dairy present themselves as being highly probable. Thus, for example, during the sickness of the child the air of the overcrowded kitchen in which it was nursed, and where the milk was sieved, served out to customers, and practically stored, must have been charged with the specific poison of the excreta of the child; and the same kind of air-pollution must have taken place from the other case of sickness, owing to the stools being carried from the bed-room through the kitchen for disposal in the privy in the yard. Again, dry ashes in a fine state of division" (there was an ash-pit privy in the yard which received the evacuations of the patients), "when disturbed by air-currents or in any other way, carry through the air a considerable distance specifically infected house-dust or stools with which they may be mixed. The milk, being placed between the air of the yard and that of the kitchen, was thus exposed to typhoid infection on both sides. Further, the milk may have received its infection from the hands or clothes of the milk-vendor or of his wife, both of whom performed the double duty of nursing the patients and milking the cows. Lastly, the unused milk from the sick-room may have by some means found its way into that set apart for distribution."

These remarks are most suggestive, and indicate several vehicles of contagion other than drinking-water, to which latter attention has been, in my opinion, too exclusively directed.

In connection with the origin of the disease at the dairy itself it is an interesting fact that one of the cows "had been very ill about the time the first case of fever certified proved fatal at the dairy." Further investigation revealed the fact that sickness had been unusually prevalent among the cows of this dairy, nineteen having been prescribed for by a veterinary surgeon during the course of four years. As the dairyman kept only from four to five cows at a time, it is evident that the majority of the animals must have been ill at one time or another.

Mr. William Brown, medical officer of health of Carlisle, to whom we are indebted for the report of this epidemic, states that he has observed typhoid fever to be very fatal and to linger persistently "in the immediate vicinity of slaughter-houses, cow-sheds, and places where tripe and entrails are cleansed. Thus, for instance, during the last four and a half years there occurred in Carlisle, in the vicinity of two slaughter-houses placed in close proximity, 7 cases of typhoid fever. Near another slaughter-house the same number of cases. Near a shed where tripe and entrails were cleansed, 5 cases; at a similar place, 1 case; in a short street where four slaughter-houses exist, 11 cases; and near a large cow-shed, 9 cases of the disease. Of these 40 cases, 10 died, or 1 death in 4 cases, or about four times the ordinary rate of fatality from typhoid fever. Lastly comes the Metcalfe street cow-byre and slaughter-house, with its 5 cases of sickness, 3 of which died, and while this paper is being written arrives a notice of a death from typhoid fever in the Carlisle urban district of Greystone in a house placed close to a cow-byre of the ordinary urban type."

Brown quotes two writers whose observations were made in South Africa—Mr. Henry Lawrence and Dr. James F. Allen—the former of whom believes an intimate connection to exist between typhoid fever and the presence of the manure of horned cattle, while the latter "endeavors to establish a connection between the incidence of typhoid fever among the inhabitants of farms and a *specific enteritis* among young calves."

If these last-mentioned observations are correct, we would expect to find an unusual prevalence of typhoid fever among the employés of slaughter-houses, but thus far this has not been demonstrated. The only mention of butchers in Murchison's classic work is that they are "said by Dr. Tweedie to be particularly exempt from typhus."[1]

Conveyance of Typhoid Infection by Air.—Numerous well-authenticated instances of this mode of infection have been reported by Budd, Bouchard, Murchison, Liebermeister, Landouzy, and others.

Landouzy reports two cases of great interest.[2] The first was a man aged twenty-five who was the only person attacked in a family of ten, and whose diet, drink, and hygienic surroundings at first offered nothing to account for his infection. On closer investigation, however, it was ascertained that the ventilating pipe of a public water-closet in a court below opened about half a yard (50 centimetres) beneath the window of his bedroom. Another case from the same reporter is almost identical in every respect; in fact, the only difference was the sex of the patient. A girl of fifteen, the only one of a family of

[1] *Continued Fevers of Great Britain*, 3d ed., 1884.

[2] Communication of Brouardel in *Annales d'Hygiène publique et de Méd. légale*, tom. 18, 1887.

five who was attacked with typhoid fever, was found to occupy a bed-room beneath the window of which was the termination of the ventilating pipe of a privy in the yard below.

The following instance of infection by atmospheric emanations is related by Bouchard:[1] A man having contracted typhoid fever at Ulm returned to his native village, where there had been no case of the disease for many years. His evacuations were thrown upon a dung-heap ("fumier"), which was removed several weeks later by five men. Of these five, four were attacked with typhoid fever, and the fifth with intestinal catarrh and tumefaction of the spleen. The dejecta of this set of patients were thrown on another dung-heap, which was removed nine months later by two men, both of whom contracted typhoid fever.

A remarkable example of this mode of infection is reported by W. V. Keating.[2] Four ladies who had returned to their home in Philadelphia, which had been tightly closed for more than two months, were attacked with typhoid fever—the first a few days after their return, the other three about three weeks later. A foul odor was observed by all who entered the house, and Mr. Bryan, an expert who was called in to examine the drainage, declared that the family had been "actually living in a sewer." The following extract from his report reveals the state of affairs: "I made the examination, and found there was no main trap in the drain-pipe. There was a three-inch galvanized sheet-iron corrugated pipe leading from the French roof between the outer front wall and the studding, and exposed in the cellar, and connected with the terra-cotta drain near the cellar floor, every slip joint of which was pouring out its deadly contents of sewer gas, to be taken up by the large portable heater, which was supplied with cold air from the cellar, and distributed through the main building. I also found the waste-pipe from the second and third story wash-basins trapped in the cellar, and smelling at the connection with the terra-cotta drain-pipe near the floor. Here were two stories of waste-pipe (with no traps under the basins) to help to vitiate the air of their respective apartments. I also found a four-inch rain-conductor run down on the outside of the back building, near the main building, all joints of which poured out their quota of sewer gas to be carried into the house through the open windows in pleasant weather. You could not stand at any of the open windows in the rear portion of the house without being sensible of the presence of sewer gas in the surrounding atmosphere, caused by the exhalation of foul vapor from the rain-conductors of the surrounding properties. After digging up the front of the cellar to put in a main trap, my workmen found the terra-cotta pipe jointed with common lime mortar."

[1] *Transactions International Medical Congress*, Geneva, 1877.

[2] *Transactions College of Physicians of Philadelphia*, 1879.

Dr. Keating reported these cases as examples of the autochthonous or *de novo* origin of the disease, but I rather incline to agree with Dr. Cleeman, who, in discussing Keating's paper, called attention to the fact that the eruption was observed in the first patient on Sept. 27th —*i. e.* eleven days after her return to the house. As the eruption does not appear before the end of the first week or the beginning of the second, this would allow too short a space (three or four days) for the period of incubation. With reference to the three other cases, the nieces and granddaughter of the first patient, they were doubtless infected by the sewer gas, which was contaminated by the dejecta of the first patient or of other patients in the neighborhood.

It is useless to add to the number of these typical examples of infection through the atmosphere, but I may call attention to the fact that this mode of infection does not imply that the disease-germs are inhaled and enter the system through the pulmonary mucosa. It is much more probable that they adhere to the buccal or pharyngeal mucous membrane, are swallowed with the saliva or the food, and find their nidus in the ileum.

Infection by Soiled Linen.—I will give no details of the conveyance of infection by the soiled linen of patients or the hands of their attendants, because—1, owing to the natural repugnance to fæcal matter, and the cleanliness which it enforces in the most careless, this mode of infection is very rare; and, 2, it appears self-evident that if the air and water can convey infection from fæcal matter, the latter may do so itself, without, so to speak, employing any intermediary.

The Relation of the Depth of Water in Wells and Subsoil Water to Typhoid Fever.—Under this head the celebrated theory of Pettenkofer and Buhl may be appropriately considered. These observers noticed that in Munich the number of cases of typhoid fever bears a relation to the height of the water-springs, being highest when these are low. They do not believe in the propagation of typhoid fever by means of drinking-water, and explain the undoubted coincidence between the prevalence of this disease and a low level of the subsoil water by the theory that when the earth is uncovered by the recession of the water the air gains access to germs previously submerged and stimulates them to unusual activity. The poison, they say, enters the system through the medium of the atmospheric air.

Dr. Henry B. Baker,[1] secretary of the Michigan State Board of Health, has verified the statements of Pettenkofer and Buhl that the rise and fall of the typhoid-fever curve are in inverse ratio to the rise and fall of the subsoil water, with the notable exception that in winter, when the ground is deeply frozen, a low level of subsoil water does not

[1] *Twelfth Annual Report of the Secretary of State Board of Health of Michigan*, 1889.

correspond with an increased prevalence of typhoid. Dr. Baker's explanation of these coincidences is, to my mind, far more satisfactory than that of the German observers.

Suppose a privy and a well for drinking-water to be adjacent: "when the level of the water is the same in the well as in the privy, there would not be likely to be a mingling of the water from the privy with that in the well unless the distance between them was small. But whenever and wherever the water in the well is below the bottom of the privy, not far distant, there will be a strong tendency of the fluids cast into the privy to pass downward toward the water in the well, or, if not directly to the well, to the ground water not far distant, which will pass into the well to replace that which is drawn." In other words, when the subsoil water is low the drinking-water, where this is derived from wells, is especially liable to be contaminated with the fluid of cesspools; and the reason why the coincidence of low well-water with the prevalence of typhoid fever does not obtain in winter is because the fluid contents of privies are then frozen, and therefore incapable of permeating the soil.

I have entered into the foregoing details of etiology because of their practical bearing on prophylaxis, and further because there is a tendency when a single case or an epidemic of typhoid fever cannot be traced to an antecedent case through contaminated water, food, or air,—there is, I say, a tendency under such circumstances to assume that undue importance has been attached to these vehicles of infection, and that other equally powerful causes are in operation. The absolute demonstration of the conveyance of the typhoid poison by drinking-water, food, or air certainly does not exclude other modes of infection, but until these are discovered it is more rational to assume, when the known causes are not demonstrable, that the time and place of contamination have escaped observation than that nothing of the sort has occurred. On these grounds I would criticise the excellent little book of Marston,[1] who refers with evident approval to the view that "there is a variety of typhoid or enteric fever, apparently identical, so far as its clinical features and post-mortem lesions are concerned, with the typhoid fever of European pathologists, which should be ascribed to a combination of conditions rather than to any one specific cause; . . . . in short, to the various factors present in a new environment."

It is a well-attested fact that those who are undergoing the process of "acclimatization," so well described by Marston, are especially susceptible to the endemic diseases of their new environment; but this is an argument rather in favor of than against specific infection. The following remarks, made by me in opening a discussion on typhoid fever in the Philadelphia County Medical Society on November 24,

[1] *Notes on Typhoid Fever, Tropical Life, and its Sequelæ*, London, 1890.

1885, explain my views with reference to predisposition and change of climate as etiological factors of typhoid fever:

"There can be no doubt that certain individuals have a tendency to neuroses, congestions, and catarrhs in the infra-diaphragmatic portion of the trunk, just as others have similar tendencies in its supra-diaphragmatic portion. In such constitutions diarrhœa is produced by causes which, in the average individual, would be followed by no such effect, such as an unusually hearty meal, the partaking of food difficult of digestion, or of food that is easily digested but of a kind to which the individual is unaccustomed; a change in the customary drinking-water; or, finally and very commonly, atmospheric changes, thermometric and hygrometric. Now, this susceptibility can be only dependent upon an unusually sensitive condition of the abdominal sympathetic system. Abnormal fluxions of blood to the abdominal vessels are the result of irritants which in individuals of more stable equilibrium would not be pathological. Among such irritants is probably the poison, the germ, of typhoid fever. We are all acquainted with single cases of typhoid in families where all have been exposed to precisely similar influences. Why is it that in these sporadic forms of the disease the majority of those exposed to the infection escape? It is because the germ finds a favorable soil in one person and not in another; and this soil is probably a catarrhal mucous membrane, which very catarrh may have been produced by the irritation of the poison, so that in individuals of the type above described the germ of typhoid fever flourishes because it is able to produce its own culture medium—*i. e.* a catarrhal mucous membrane.

"Another cause favoring the development of the typhoid germ—and, I believe, through abdominal hyperæmia—is change of climate. Dr. Leffmann has confirmed my observation, made in a general way, of the large proportion of foreigners attacked with typhoid fever in a certain section of this city—that in which the Episcopal Hospital is situated. In a ten years' service at that institution I have yearly observed a large proportion, if not a preponderance, of Germans and Englishmen—mostly weavers—among the cases there treated."

From the foregoing remarks it is evident that the prophylactic treatment of typhoid fever may be divided into two heads: 1. Prophylaxis of the community, or municipal prophylaxis; 2. Individual prophylaxis. The former cannot be appropriately considered in this work. It belongs to the general subject of hygiene, and is not so much in the hands of physicians as in those of city officials. Science has enabled us literally to place our finger on this enemy of our race, and why should we hesitate to crush it? Certainly not on account of any possible expense, for, as Brouardel well remarks, nothing is so costly as an

epidemic.[1] The time has gone by when such visitations can be ascribed to the stars or the gods. The day of "stellar pathology," as it is called by Symes Thompson,[2] has passed, and our present knowledge has brought with it new responsibilities. For every case of typhoid fever some one is responsible, and for every epidemic the whole community.

Individual Prophylaxis.—Turning our attention solely to individual prophylaxis, we find that it includes the disinfection of food, especially water and milk, and of the discharges, both fæcal and urinary, of typhoid-fever patients. In times of epidemic the drinking-water should be boiled, and at all times in cities in which typhoid fever is endemic it should be filtered. The Bischof spongy-iron filter, the Chamberlain-Pasteur filter, and perhaps others, remove "much of the dissolved organic matter and practically all the suspended matter, including the microbes." The filtrate does not, however, remain sterile indefinitely. Sooner or later, the micro-organisms pass through with the water, probably by a process of growth, just as the bacilli of tubercle pass through the diaphragm from the pleural cavity and invade the peritoneal, or *vice versâ*. An occasional cleansing of the filter is therefore necessary, and in the case of the Chamberlain-Pasteur instrument this is very readily accomplished, for it is composed of tubes of unglazed biscuit-ware, which may be thoroughly sterilized by boiling.

With reference to suspected milk, the only safeguards are total abstinence or boiling.

The stools of typhoid patients should be immediately and thoroughly disinfected—a result which I have no hesitation in saying is scarcely ever accomplished. The crudest ideas prevail with reference to this vitally important matter, and the teachings of many accepted textbooks are misleading. For example, a recent work on hygiene recommends a 5 per cent. solution of carbolic acid as an efficient disinfectant of typhoid dejecta, and a little farther down on the same page stultifies this advice by the statement that the germicide action of this solution upon the discharges is not complete until twenty-four hours have elapsed. A typhoid stool should be thoroughly disinfected before it is thrown into the privy or water-closet, and therefore speedy action is one of the most important qualities of a disinfectant. On this ground carbolic acid should be consigned to oblivion, so far as its employment as a disinfectant in typhoid fever is concerned.

By far the best laboratory germicide is corrosive sublimate, 1 pro mille, but in the sick-room it is open to certain practical objections. The first of these is its poisonous nature. If kept in solution it should be colored, as recommended by Wilson, with potassium permanganate, but it should never be kept in solution. When needed a compressed tablet

[1] "Rien ne coûte cher comme une épidémie."

[2] *Influenza*, London, 1890.

of the requisite strength, $7\frac{3}{10}$ grains, should be dissolved in a pint of hot water. Another practical objection to corrosive sublimate is that it coagulates albumin, so that in case of a typhoid stool containing blood-clot or sloughs from ulcers the exterior of these albuminous particles will be coagulated, while the typhoid bacilli will be carefully preserved within them. In such cases nothing short of trituration will thoroughly disinfect. Finally, corrosive sublimate is destructive to water-pipes and all kinds of plumbing-work.

The disinfecting power of lime has recently been the subject of careful study by E. Pfuhl[1] of Berlin, who has determined with precision the proportions by weight and volume in which it must be mingled with typhoid discharges in order to disinfect them in one, two, three hours, etc., the speed with which this is accomplished depending, of course, upon the quantity added. In the sick-room, however, it is out of the question to dispense a disinfectant by weight or measure as in a laboratory, and Pfuhl, who, being a practical physician, appreciates this fact, has ascertained that a typhoid stool is thoroughly disinfected when sufficient milk of lime (Kalkmilch) to produce a strong alkaline solution is mingled with it. Even this direction is too chemical, for it involves the use of test-paper, and therefore the nurse should be told to *deluge* the discharges and thoroughly mix them with the lime. The latter injunction is most important, especially when the discharges are not of fluid consistence. The advantage of lime as a disinfectant are its speedy and thorough action, absence of odor, cheapness, and entire safety, in all of which respects it contrasts most favorably with all other disinfectants. Unlike corrosive sublimate, lime is a penetrating substance; *i. e.* it does not, by hardening the surface of albuminous or other bodies, oppose a barrier to its own progress. In the present state of our knowledge of disinfectants I not only give lime the decided preference, but am almost inclined to say that none but lime should be used. With reference to its preparation, it is enough to direct the nurse to mix slaked lime in an earthen or wooden vessel with sufficient water to make a thick "whitewash."

Hydrochloric acid has been strongly recommended as a disinfectant of typhoid discharges, for which purpose they may be mixed with a solution containing 33 parts of crude hydrochloric acid and 67 parts of water. This substance is, however, open to objections similar to those which apply to corrosive sublimate. It is poisonous, destructive to plumbing-work, and, in addition, throws off irritating acid fumes.

It has been proposed to bury the fæces of typhoid patients, but this is a very questionable method of disposing of them, for Fränkel has demonstrated that the typhoid bacilli may multiply when placed in the earth three metres below the surface.

[1] *Zeitschrift für Hygiene*, Band 6, 1889.

Boiling water added to typhoid discharges does not surely disinfect them. Prolonged ebullition is necessary for this purpose—a method evidently out of the question.

The soiled as well as the unsoiled linen of typhoid patients should be boiled for several hours or destroyed by fire. For the hands of physicians and nurses the best disinfectant is thorough washing with soap and water, followed by rinsing with a solution of corrosive sublimate, 1 pro mille. A certain degree of ostentation in performing such ablutions is pardonable to the physician, if not actually enjoined upon him, for the sake of example to nurses and attendants. It is scarcely necessary to add that after using the clinical thermometer the instrument should be carefully cleansed and disinfected.

The measures of individual prophylaxis which I have enumerated are of the simplest description, but are none the less effective on that account. It is mathematically certain that if, in a given epidemic, the typhoid infection is conveyed by drinking-water, those who drink nothing but water sterilized by boiling or other means will escape. It is equally certain that if the chief source of infection, the fæcal matter of fever patients, be sterilized, the disease will be greatly diminished, if not extinguished. It is manifestly the duty of every individual to protect himself, to say nothing of others, from infection, and the instinct of self-preservation is so strong that it would seem unnecessary to inculcate it. The self-satisfaction of ignorance is, however, equally strong, especially when it relates to matters of hygiene, and therefore improvement in the prophylaxis of infectious disease can only be reached when hygiene is thoroughly taught in our schools and colleges and recognized as the most beneficent of the sciences.

Curative Treatment.

A case of typhoid fever is an instance of neglect or failure of prophylaxis. Unfortunately, at the present time such instances are so numerous that the physician, if not more concerned, is certainly more occupied in repairing the ravages of this disease than in preventing them. Its curative treatment, therefore, naturally assumes the first importance in the eyes of most practitioners, and may be divided into three heads—hygienic, dietetic, and medicinal.

Hygienic Treatment of Typhoid Fever.—The sick-room should be large, airy, well ventilated, and divested of unnecessary furniture. The windows should be behind the head of the bed or parallel with one of its sides, and of these two arrangements I prefer the latter, for there is something tantalizing in having the back turned to the light of day; while, on the other hand, it is most refreshing to many patients, especially in the country, to look out of doors, where the sight of green leaves trembling in the breeze is far more enlivening than that of their

dingy, flickering shadows on the wall. The fear of draughts is chimerical so far as the patient is concerned and so long as the fever continues, for the well-known dictum of Jürgensen is confirmed by universal experience: "Wer fiebert, erkältet sich nicht."

The light should be tempered, and in summer the sunlight excluded, but the tendency is to keep the sick-chamber too dark. Sleep at night is favored in the sick as in the well by preserving, as far as possible, the normal distinctions between night and day.

The temperature of the sick-room is never beyond control except in the tropics and during the excessive summer heat of so-called temperate zones. Under the latter circumstances the air may be cooled by exposing a large block of ice in a suitable receptacle, in accordance with Marston's suggestion. In cold weather heat and ventilation are best secured by means of an open fire. Whenever possible the thermometer should not be allowed to rise above 65° F.

Rest is an agent which may be looked upon either as hygienic or medicinal; but, whatever opinion be held of its nature, it is of the first importance in typhoid fever, and should be insisted upon as soon as the disease is suspected. If the patient is away from home when attacked, he had better, as a rule, remain away, for all ordinary inconveniences are better supported than the fatigue of a long railway journey. Liebermeister[1] and Sir William Jenner have called attention to the importance of rest in the beginning of typhoid, and the latter states that the effect of travel is "to make what would otherwise have proved a mild case severe, and to cause a bad case, which might after perhaps a struggle have ended favorably, to terminate in death." From my own experience I can recall cases illustrating the disastrous effects of physical exertion and railway travelling in the early stage of the disease.

Quiet should be preserved in the sick-chamber, and therefore no attempt to entertain the patient by reading or conversation should be permitted. I have never known a patient with typhoid fever to express the need of amusement or entertainment, or to complain of time hanging heavy on his hands. This is due to two causes: 1. The normal sensations with reference to the passage of time are blunted; 2. He is abundantly occupied with his own morbid fancies, which are not always of a disagreeable nature. I recently attended, through a well-marked attack of typhoid fever, a young woman, who never, during the course of the disease, manifested any signs of delirium, and who always returned rational answers to questions, and yet when I asked her during convalescence concerning certain objective features of her illness, she had no recollection of them whatever, while of the subjective scenes, and especially of an imaginary old woman who figured in most of them, her memory was excellent. It might be supposed by

[1] *Ziemssen's Cyclopædia*, vol. i., New York, 1874.

the inexperienced or unobservant that attempts should be made to divert the mind from its vagaries and restore it to normal paths. This, however, is a decided mistake, for the effort of inhibition required to fix the attention is attended, as in health, with fatigue; and it is on account of this mental fatigue or exhaustion that Nature has removed the brakes of inhibition. No attempt should be made to reapply them until the machine has been thoroughly repaired.

Dietetic Treatment of Typhoid Fever.—The most approved hygienic and medicinal treatment will be of no avail if the patient is allowed his own way with reference to diet. Remarkable stories are told by Stokes and others in illustration of the success which sometimes attends a compliance with the patient's whims in this respect, but none of them are applicable to typhoid fever. In this disease the characteristic lesions are seated in the gastro-intestinal tract, and are by no means necessarily limited to the ileum. Instances of typhoid ulceration in the gastric mucosa have been reported by Chauffard,[1] Chiari, Weiss,[2] and others, and there can be little doubt that they would be more frequently found if sought for. But, as I have elsewhere remarked, such a search is decidedly exceptional, since there is a general belief that all claims to represent typhoid fever have been long since pre-empted by the ileum.

Among the consequences of this localization of the morbid process are anorexia, dyspepsia, and diarrhœa, and the indications they furnish with reference to food are that it should be of the blandest, most digestible, and most nutritious character, and be administered at stated intervals with little or no regard to the patient's desires. It is very rare for a typhoid-fever patient to express a desire for food, but that is no proof that he does not need it. As Graves[3] remarks, it might as well be argued that the urine should be allowed to remain in the bladder because the patient has no desire to expel it, as that food should be withheld because he does not ask for it.

It is customary for writers on the dietetic management of typhoid fever to lay down the rule that no solid food should be administered in that disease, but a little reflection will show the crudity of such advice. It is not so much solid as indigestible food that should be eschewed, and it should never be forgotten that all foods except such as are predigested are solid in the first stage of digestion. Milk is justly regarded as the blandest, the most digestible, and the most nutritious food that can be administered to a fever patient, but from a dietetic point of view it is not a liquid food, for it no sooner enters the stomach than it is solidified by the milk-curdling ferment (the Labferment of the Germans)

[1] "Étude sur les déterminations gastriques de la fièvre typhoide," *Thèse de Paris*, 1882.

[2] *Wiener med. Presse*, Nos. 13 and 14, 1887.

[3] *Clinical Lectures.*

with which it comes in contact. There is no exception to the rule that digestion is a process of liquefaction. The habit of regarding milk as a liquid food has been the cause of much abuse in its administration. It has been apparently assumed by many practitioners that milk may be given *ad libitum* without bad effects, and that the proper quantity for the patient is determined solely by his ability to ingest it. Waiving the question of etymology, I need only refer to the case of a child abundantly supplied with some luscious article of food to prove that ingestion and digestion are very different things. As far as judgment is concerned, a patient with typhoid fever is *in statu pupillari*, and the amount of his food should be regulated by his ability to digest it. It is here that the judgment, the skill, and, above all, the experience of the physician come into play, for there are no fixed rules with reference to this important matter. The observant physician is, however, by no means without guidance, and his decision whether his patient's diet is correct as to quantity and quality will depend on his knowledge of the natural course of the disease and his diagnostic skill in determining whether a sudden rise of temperature, accompanied with restlessness, tympany, perhaps also with abdominal pain, is or is not due to indigestion. The most valuable assistance in solving this diagnostic problem may be derived from an inspection of the stools, in which the detection of shreds of undigested casein is proof positive that the patient is receiving too much milk.

In the dietetic management of typhoid fever the tendency at the present day is toward overfeeding, and especially with milk. A physician who undertakes the management of a case of typhoid fever in a region where good cow's milk cannot be procured is at a disadvantage, but he had better be deprived of this resource than use it injudiciously. I cannot better illustrate the importance of making the supply of milk subordinate to the patient's digestive capacity than by quoting from an address on the treatment of typhoid fever, delivered by Sir William Jenner before the Midland Medical Society at Birmingham on November 4, 1879:[1] "I have seen the patient restless, sleepless, or drowsy, his temperature raised several degrees above what it had previously been, vomit, eject a quantity of curd, and at once the restlessness cease, the temperature fall, the skin become moist, and the patient drop into a quiet sleep. All the threatening symptoms vanish with the ejection of the offending material. Or the undigested curds may accumulate in the bowel, inducing flatulent distension and pain in the abdomen, restlessness and increased febrile disturbance. Under these circumstances I have seen an enema of thin gruel bring away a large vesselful of offensive, sour, undigested curds. Or, again, the undigested curds may themselves (and this has not been an uncommon

[1] *Lancet*, vol. ii., 1879.

consequence of milk diet in my experience) irritate the bowels, and produce, keep up, or greatly increase diarrhœa. A distinguished chemist once remarked to me, 'Do not forget that a pint of milk contains as much solid animal matter as a full-sized mutton-chop;' and solid the casein of the milk must become before it can be digested; and yet I have known a patient drink two quarts and even more of milk in twenty-four hours—*i. e.* solid animal food equal to four mutton-chops. Can anything approaching to such an amount of solid animal food be digested? and if it could is such an amount of animal food good for a patient suffering from typhoid fever?"

In prescribing milk it must also be remembered that this substance is of variable composition, and that the patient's inability to digest it may be due to the fact that it is too rich in cream. According to Voit,[1] a healthy adult prisoner while idle requires 85 grammes of albumin, 30 grammes of fat, and 300 grammes of hydrocarbons *per diem*, while two litres (about $3\frac{1}{2}$ pints) of milk contain only from 68 to 70 grammes of albumin. The fat in this amount of milk will be twice as much as is necessary, and the hydrocarbons about one-third the necessary amount. In this statement it is presumed that the milk is an average specimen—*i. e.* containing not more than from 8 to 10 per cent. of cream. When it is remembered that some specimens of Alderney milk contain from 20 to 30 per cent. of cream, and that zealous attendants on the sick naturally suppose that when milk is ordered it must be of the richest quality, it becomes manifestly important for the physician, in prescribing this substance, to have an eye to its quality as well as its quantity. As regards quantity, not more than one quart of an average specimen (8 per cent. cream) of unskimmed milk should be given daily. If more than this amount is given, it should be skimmed. The deficit in albumin may be made up by giving meat-juice twice daily or some preparation of beef peptone. Home-made beef-tea is a very refreshing beverage, but contains little or no albumin, this substance being coagulated and retained in the meat during the process of cooking. There are several excellent manufactured preparations so rich in albumin that tea-spoonful doses furnish all of this substance that is required in typhoid fever. The articles to which I refer are so well known as to need no specific mention, and besides it is the duty of every intelligent practitioner to test such preparations for himself, both chemically and clinically.

The deficit of hydrocarbons above referred to as inherent in an exclusive milk diet cannot be made up, and clinical experience proves that the absence of these substances is not detrimental. I am not in favor of administering arrowroot, rice, oatmeal porridge, or, in fact, any form of solid or semisolid starchy food, to typhoid-fever patients.

[1] *Zeitschrift für Biologie*, 1872.

My objection to these substances does not arise from the fact that they are in any sense of the word "solid," but is based on the belief that they are indigestible. In typhoid fever the salivary secretion is very deficient, and the same is almost certainly true of the other secretion, the pancreatic, concerned in the digestion of hydrocarbons. Clinical experience also shows that the use of starchy food in typhoid fever gives rise to tympany and other signs of intestinal indigestion. A certain amount of soluble starch may safely be administered in the form of barley-water.

If milk is not digested, as proved by the presence of coagula of casein in the stools and other signs and symptoms of indigestion, it should not only be skimmed, but peptonized. Experience has proved the advantage of adding a small quantity of lime-water—half an ounce of lime-water to four ounces of milk—to each dose of milk. Any tendency to acidity is thereby counteracted, the casein is diluted, and its digestion facilitated. Goat's milk should never be selected for a typhoid-fever patient, as the coagula which it forms in the process of digestion are remarkably tough. If none other than goat's milk can be procured, it should invariably be peptonized.

The patient should be allowed an abundance of pure, cool water, and encouraged to drink it. The latter injunction is most important, for during the fastigium of typhoid fever the sense of thirst is as much obtunded as that of hunger.

The characters of the blood in typhoid fever are such as indicate a deficiency of water. In the first place, it is of a dark, blackish-red color, and is generally obtained by needle puncture of the finger with more than ordinary difficulty. In 1885, I counted the red blood-corpuscles in five cases of typhoid fever during the fastigium of the disease, the result being an average of 5,176,200 per cubic millimetre.[1] These figures are just what one obtains in perfectly healthy persons, and can only be explained by the theory of a deficit of water in the blood. This view is corroborated by the facts that in two of my cases I counted the corpuscles during the stage of convalescence, and in both found a marked diminution in their number—in one amounting to 804,000 per cubic millimetre; in the other to 1,306,000. This apparent falling off in the quality of the blood at a time when fever has ceased, appetite and digestion are good, and strength is rapidly returning, is evidently due to a restoration of water to the blood. The processes of hæmatopoiesis are the same after fever as after hæmorrhage: first, the volume of the blood is restored by the absorption of water; next and more slowly, the number of red corpuscles is raised to the normal; and, finally each corpuscle appropriates its proper amount of hæmoglobin. In one of my cases I noted that the fingers were shrivelled, "a condi-

[1] *The Polyclinic*, Philadelphia, September 15, 1885.

tion either to be explained by ischæmia from local vascular spasm or by a general deficiency of water in the blood. The condition was too long continued to warrant its being referred to vascular spasm, and the other positive facts in regard to the gross and microscopic characters of the blood point unmistakably to a state of *anhydræmia*."[1]

The late Dr. John Forsyth Meigs[2] was accustomed to insist with great emphasis on the importance of supplying water in abundance to typhoid-fever patients. His experience, which was unusually large, had led him to believe that death from this disease was often due to want of water, and he urged the importance of continuing to supply it after the patient had lost all sense of thirst. The following quotation is from a lecture delivered by him at the Pennsylvania Hospital in 1879: "When I stand by the bedside of a severe typhoid fever, and see the patient motionless, insensible, dead to all the usual senses of the living; when I look at his half-closed eyes, his gaping mouth, his dried and fissured tongue; when I brush the unheeded flies from his poor, unconscious face; and when I touch his hot and burning skin,—I ask myself into what lower estate the human body can fall. Not only has the patient lost all appetite for food, not only is he dead to all that surrounds him, but this hot and withered body, this dry and pasty mouth, filled with desiccated crusts and sordes, knows no longer even the sense of thirst. This has been the last sense of which he has been deprived. So long as he retained any consciousness at all he would ask for water or for ice. Now he feels not even this great want. It is in this crisis of his life that he is to be saved, if saved at all, only by the constant care of his physician, nurses, and relatives. And woe to the physician who can look on such a sight and not yearn to know all that his art has acquired through centuries of experience and study!"

With reference to the amount of water required by a fever patient, our standard of comparison is the quantity consumed by a healthy adult at rest. This has been found to be about eighty ounces. In typhoid fever, however, the organism, so far from being at rest, is in a condition of turbulent activity, and besides is undergoing abnormal losses of water through the increased action of skin and bowels. Eighty ounces can therefore only be regarded as the minimum supply.

[1] The surest method of conveying water to the tissues is by subcutaneous injection of "normal saline solution"—a solution of common salt of the strength of 50 grains to the pint. About three years ago I treated a number of cases of pneumonia at the Philadelphia Hospital in this manner, and with excellent results, both as regards palliation and cure. Hermann Sahli (*Volkmann's Sammlung klinischer Vorträge*, No. 11, 1890) has recently practised the same method with success in two cases of typhoid fever. By means of an apparatus designed by himself he was able slowly to inject a litre of the solution beneath the skin of the abdomen or elsewhere. One of the most rational indications of typhoid fever is certainly fulfilled by such injections.

[2] *On the Internal Use of Water for the Sick, and on Thirst*, Philadelphia, 1880.

Clinical experience, the highest court of appeal in all therapeutic questions, confirms the inferences derived from these physiological facts, it having been found by Meigs and others that one hundred and thirty ounces of water may be given daily to a typhoid-fever patient with none but beneficial results. It has been objected that such amounts of fluid, by their mere bulk, will interfere with the ingestion of other and more nutritious food. To this it may be replied that the question of nutriment is a relative one, depending upon the immediate wants of the system. To a person perishing from thirst nothing is so nutritious as water. The strongest argument in favor of the cold-bath treatment of typhoid fever is that it prevents certain tissue-degenerations, especially of the heart, which are generally ascribed to long-continued pyrexia. It is, however, at least questionable whether these cellular changes are not quite as much due to long-continued drought. We do not attribute the desiccation and decay of vegetables during the torrid heat of summer so much to the presence of heat as to the absence of water; and the facts with reference to our own tissues during the "heated term" of a fever are precisely analogous. The opinion that parenchymatous degeneration in typhoid fever is due to want of water is held also by Dr. Henry Hun[1] of Albany, who believes that it may be obviated "quite as well by giving plenty of water to the patient to drink as by cold baths." In a word, our bodies in health are more fluid than solid, and cannot perform their functions unless this fluidity is maintained: "*Corpora non agunt nisi fluida.*"

There is another food-substance, formerly prominent as an article of diet for the sick, which has fallen into unmerited disuse. I refer to gelatin. The history of this substance affords one of the innumerable instances of the tendency of the scientific mind to pass from one extreme to another. During the great French Revolution the feverish mental activity, which displayed itself most conspicuously in the field of politics, was manifested in every department of science. Among other subjects, the best and most economical method of supplying the French armies with food was studied by numerous physiologists in what now appears to us a very superficial manner. One of the hasty conclusions of their researches was that gelatin is the nutritious substance of meat, and that from one pound of bones could be extracted as much and as good soup as from six pounds of flesh. This opinion of the value of gelatin was formulated in the extravagant and inflammatory statement that one dozen bone buttons represented a certain amount of soup stolen from the poor. Notwithstanding this tender solicitude for their welfare, the poor never took kindly to the food recommended by the first gelatin commission of 1802 (24 Messidor, year X of the Republic), thus showing that the voice of Nature,

[1] *Albany Medical Annals*, 1885.

although not so loud as that of so-called authority, is much more convincing. By degrees doubts began to be entertained concerning the nutritive value of gelatin, which found their principal exponents in Donné, Gannal and Edwards, and Balzac. A second gelatin commission was appointed, which made its celebrated report through Magendie, in 1841, to the effect that gelatin is not only devoid of nutriment in itself, but impairs the nutritive value of other foods when mingled with them. Such a condemnation is, of course, absolute, and it is not surprising that the reputation of gelatin has never recovered from this verdict, which was pronounced by some of the greatest physiologists of the age. These are the extremes of opinion with reference to this substance—viz. extravagant laudation by the first gelatin commission, absolute condemnation by the second. The truth, as a matter of course, lies midway between them. Gelatin alone cannot support life; neither can albumin, which is a recognized type of nutritious substances. But whence, it may be asked, arose the error that gelatin mingled with foods of well-known nutritive value is injurious to the system? Simply from the fact that in those experiments of the second gelatin commission in which gelatin was mingled with other articles of food the former was added to the latter, as a rule, in inordinate quantity. Large amounts of gelatin give rise to diarrhœa, but the same effect follows the ingestion of too much fat or common salt. Without entering into details concerning the experiments of the second gelatin commission, it suffices to state that their fallacies have been exposed by Carl Voit, who in 1872 determined with scientific precision the real value of gelatin. The result of his researches may be summed up in the statement that gelatin is an albumin-sparing substance. In other words, the amount of albuminous food necessary to maintain our bodies in a state of nutritive equilibrium is lessened by the ingestion of a certain amount of gelatin. This albumin-sparing property of gelatin renders it a most appropriate food in febrile conditions in which there is excessive destruction of the albumin of the body, and it is best administered in the form of peptonized milk-jelly. This is very palatable, and is composed of peptonized milk, to which, while hot, a certain amount of gelatin is added. It is then sweetened, flavored with orange, lemon, wine, brandy, or rum, and eaten cold. In cases of typhoid fever in which diarrhœa is a prominent feature gelatin should be used sparingly or not at all.

To recapitulate: in the dietetic treatment of typhoid fever the main reliance should be upon milk, which may be given, skimmed, to the extent of two quarts per diem. This is a maximum amount. In addition, water should be freely administered, the patient being given as much as he will take. In one of Meigs's cases the average daily amount of free water consumed during a period of twenty-one days

was thirty-three ounces; in another, the average amount for eighteen days was fifty-three ounces. Besides milk and water, beef-juice or beef-peptone should be given at least twice daily, and once in the twenty-four hours a small cup of beef-tea, chicken-broth, or mutton-broth. An egg prepared in the following manner is often well relished and digested: a common *thick* kitchen cup is immersed in boiling water for one minute, then removed and the water poured out. A fresh egg is then placed in the cup, and rapidly stirred with a spoon or fork. The heat retained by the thick cup is sufficient to *cook* the egg enough to remove the raw taste which is so unpleasant to many people. I have found an egg prepared in this manner a valuable addition to the limited diet-list of fever patients. Finally, a claret-glass of peptonized milk-jelly may be given on alternate days.

On such a diet as I have outlined the patient will be abundantly nourished. The quantities of each article cannot be arbitrarily prescribed, but must be varied to suit the needs of individual cases. In order to furnish sufficient nourishment the intervals of feeding must necessarily be short, and it is a safe rule never to allow more than two hours to pass without the administration of either food or drink.

Medicinal Treatment.

The undoubted fact that the majority of cases of typhoid fever will recover without medication if the above-mentioned hygienic and dietetic measures are adopted, does not justify a purely expectant line of treatment, so far as drugs are concerned. This statement would still hold good if recovery were the invariable rule, for in that case our therapeutic efforts would be chiefly directed toward curtailing the course of the disease, mitigating its severity, and preventing complications. It may be said that this is more than we can certainly accomplish at the present time. Doubtless, this is true, but it is not nearly so much as we attempt, our first object being to save life. It is very difficult to convince one's self, to say nothing of others, that in a given case of typhoid fever life has been saved by the skilful use of drugs or other medicinal measures; but if, in a series of cases, we observe an immediate mitigation of the most threatening symptoms, followed by progressive improvement, we are certainly justified in believing that a certain number owe their recovery to the treatment pursued. This is precisely the experience of numerous competent observers, and it is underestimating the value of medicinal measures in typhoid fever to say that those who have had most experience in their use would be least willing to dispense with them. It must be admitted that there is no drug or method of treatment that will arrest the course of the disease. The claims of the so-called jugulant methods are all open to serious criticism. In the first place, such modes of treatment must be instituted on the first suspicion

of typhoid fever—*i. e.* at a time when it is impossible to say with certainty that the case is not merely one of gastro-intestinal catarrh, influenza, or other form of catarrhal fever; secondly, a certain number of mild cases—*typhus levissimus*—are observed in all epidemics, running their entire course in from twelve to fifteen days. In other words, the natural course of many cases of typhoid fever is an abortive one. If due allowance is made for errors in diagnosis and for cases essentially mild, there is nothing left to support the theory of a jugulant treatment of typhoid fever.

Although we know of no specific for this disease, the hope that one may yet be discovered is justified by the general results of modern bacteriological research, and especially by the destruction of the micro-organisms of one of the infectious diseases—the *Hæmatozoön malariæ*—by appropriate treatment. The effect of quinine upon this microbe, which has its seat in the red blood-corpuscles, shows that a specific will find its prey in the most recondite quarter of the organism. In the mean time, however, we must be content to mitigate as far as possible the effects of the typhoid poison. In other words, our treatment is almost purely symptomatic, and has for chief objects the control of pyrexia, diarrhœa, and other abdominal disorders, and the prevention of complications. The latter indication may be regarded as prophylactic rather than symptomatic, but the surest mode of forestalling complications is to be on the alert for the symptoms by which they are almost always heralded.

Antipyretic Treatment.—Although typhoid fever may run its course, sometimes a fatal one, with little or no elevation of temperature, the control of pyrexia is undoubtedly a prominent indication in the great majority of cases. From the earliest times this has been met by the use of baths and effusions either warm or cold. For example, Hippocrates is responsible for the statement that a fever which does not proceed from the bile is cured by abundant effusions of warm water upon the head.[1] Although bearing but indirectly upon our subject, it is an interesting fact that Rhazes advises cold baths in measles: "But if you find the patient after this medicine suffers uneasiness and anxiety, and perhaps fainting, then let him sip cold water, and sit in it for a short time; and cover him up, until his inquietude is assuaged and the measles come out to the surface of the body."[2]

To James Currie[3] undoubtedly belongs the credit not only of having

[1] Ἢν πυρετὸς μὴ ἀπὸ χολῆς ἔχῃ, ὕδατος πολλοῦ καὶ θερμοῦ καταχεομένου κατὰ τῆς κεφαλῆς λύσις τοῦ πυρετοῦ γίνεται.—*Aphorisms*, section vii., No. 42.

[2] Greenhill's translation, p. 92, Sydenham Soc.'s edition.

[3] *Medical Reports of the Effects of Water, Cold and Warm, as a Remedy for Fever and other Diseases*, Liverpool, 1798.

first systematically employed cold ablutions in the treatment of fever, but also of having obtained the indications for their use by the thermometer. It is a most interesting fact that this practitioner, who was nearly a century in advance of his time, took the temperature precisely as it is now taken, and even invented a self-registering thermometer for the purpose.

"In taking the heat of the patient," says Currie, "I have generally used a small mercurial thermometer of great sensibility, with a movable scale, made for me by Mr. Ramsden after a form invented by the late Mr. Hunter, and used by him in his experiments on the heat of animals; and I have introduced the bulb under the tongue with the lips closed, or under the axilla, indifferently; having found by repeated experiments that the heat in these two places corresponds exactly, and gives a just indication of the heat of the surface of the body where sheltered by the necessary teguments and secluded from the contact of the external air. Finding, however, considerable risk in using the straight-tubed thermometer in contagious diseases, I got some instruments of this kind made with a small bulb curved at the end. The bulb being introduced under the tongue or the axilla, the observer can stand behind the patient and mark the rise of the mercury without coming into the immediate sphere of his respiration. Though no injury was in any case incurred from the use of this thermometer, yet a further improvement has suggested itself. By introducing a small piece of iron into the tube, after the manner of Mr. Six, a permanent indication of the greatest heat is obtained, and the approach of the observer toward the patient during the experiment becomes unnecessary."

While Currie's cases were mostly typhus, there can be little doubt that cases of typhoid—a disease at that time confounded with typhus—were also treated by him with cold effusions. He was induced to employ this method by the narrative of Dr. Wright of Jamaica, who was attacked with fever, caught from a sailor, on his homeward voyage to England. Wright noticed that when on deck, exposed to the cold air, he felt better in every respect; and this circumstance, coupled with the failure of other means of relief, induced him to practise on himself what he had long wished to try on others in fevers similar to his own. He gives the following account of his experiment: "*Sept. 9th.* Having given the necessary directions, about three o'clock in the afternoon I stripped off all my cloaths, and threw a sea-cloak loosely about me till I got upon the deck, when the cloak also was laid aside. Three bucketsful of salt water were then thrown at once on me. The shock was great, but I felt immediate relief. The headache and other pains instantly abated, and a fine glow and diaphoresis succeeded. Toward evening, however, the febrile symptoms threatened a return, and I had again recourse to the same method as before, with the same good effect.

I now took food with an appetite, and for the first time had a sound night's rest.

"*Sept. 10th.* No fever, but a little uneasiness in the hams and thighs; used the cold bath twice.

"*Sept. 11th.* Every symptom vanished, but to prevent a relapse I used the cold bath twice."

Another passenger on the same ship was also attacked with fever, and was treated successfully with cold affusions. Wright's voyage in which he practised this treatment was made in the year 1777. The cases were probably typhus.

Currie mentions certain precautions which should be observed by the physician employing the cold-bath treatment of fever: 1. It should not be used when "any considerable sense of chilliness is present, even though the thermometer, applied to the trunk of the body, should indicate a degree of heat greater than usual." 2. It should be used with great care, if at all, when the surface is bathed in perspiration.

He points out that perspiration is often prolonged by artificial means, such as too much bed-covering, the body being thereby prevented from cooling. Under such circumstances the heat will sink rapidly on mere exposure to the external air—a measure, by the way, too little employed. It is meddlesome therapeutics to plunge into a cold bath a patient whom Nature is endeavoring to cool by profuse perspiration.

The work of Currie bears the stamp of exact observation and careful experiment, and, although his fame has been overshadowed by more recent hydropathists, this does not imply that their merits are greater, for the power of one object to eclipse another does not depend so much upon its size as its proximity to the eye.

With reference to Currie the late Dr. Seguin[1] remarks: "Thermometry pervades the whole of Currie's practice; nevertheless, it influenced very little the medical profession. So that for many years his *Medical Reports* stood alone, ... a melancholy monument of what a single man can conceive and the many cannot comprehend."

In 1849, Wanner[2] advocated the treatment of all phlegmasias, whether general or local, internal or external, by the application of cold. He employed cold poultices in surgical affections, and in his medical febrile cases administered ice by the mouth and a cold enema every six hours, conjoined with sponging the surface with ice-water. In 1866 the same author communicated his mode of treatment to the Academy of Medicine in a memoir which was examined by a commission composed of Louis, Grisolle, and Briquet. In their report it is stated that one of the commission had observed the effects of this treatment for several years in hospital practice, and had always found it efficacious.

[1] *Medical Thermometry and Human Temperature*, 1876.

[2] *Compt. Rendus de l'Académie des Sciences*, tom. xxix. p. 591.

Under its use agitation, delirium, and cephalalgia invariably diminished or disappeared. Besides sponging his patients at short intervals with cold water, Wanner administered an emetic and a saline purgative at the commencement of the illness, and allowed nothing but bouillon and wine for nourishment.

Excellent results were obtained by Le Roy[1] (de Béthune) by the conjoined employment of bleeding and the external application of cold. Starting out with the proposition that the two most important indications in the treatment of typhoid fever are to combat congestions of internal organs, especially the lungs, spleen, and brain, and to reduce the temperature, Le Roy declares that these are fully met by bleeding—a therapeutic agent which he believes to be as important in this disease as quinine in the malarial fevers. The amount removed from an adult by Le Roy averaged from 850 to 1500 grammes, while in children under the age of six he had recourse to leeches. It is only during the first week of the disease that he recommends bleeding. After this period he believes it to be contraindicated, but not, as may be supposed, lest the strength of the patient be too much reduced by the loss of blood, but because during the second week there have formed in the intestine ulcerations which, says Le Roy, are so many open doors for the introduction of putrid material into the blood; and, he continues, every one knows that bleeding is favorable to absorption. This intelligent observer does not claim to have aborted typhoid fever by bleeding, but merely to have given the course of the disease a favorable direction. After the bleeding a marked remission of the principal symptoms is observed, but this is of short duration, and the disease soon reverts to its former course unless the favorable effect of the depletion is maintained by the application of cold. The refrigerant treatment is thus applied by Le Roy: A folded cloth or large napkin is immersed in water as cold as possible, applied to the abdomen, and covered with a dry cloth to prevent wetting of the patient's arms and bed-clothes. The dressing is at first renewed as soon as it becomes warm; later, in accordance with the general temperature and other symptoms, although it does not appear that Le Roy was guided in his treatment by the thermometer. Internally cold water is given freely by the mouth, and occasionally by enema. No medicine is given, unless a decoction of dog's grass ("chiendent") be regarded as a drug. Under this treatment Le Roy claims that the skin gradually cools; the pulse loses in frequency and gains in regularity; headache, stupor, and delirium disappear in a few days; thirst is appeased; the tongue becomes clean and moist; abdominal pain and tenderness, meteorism and diarrhœa, diminish; natural sleep returns; in a word, there soon remain so few traces of the disease that from the eighth to the fifteenth day the patient

[1] *L'Union médicale*, 1852.

is apt to regard himself as cured, and the inexperienced physician is likely to agree with him.

I have referred somewhat *in extenso* to Le Roy's treatment for several reasons: In the first place, his work bears the stamp of accuracy and is based on a large experience; secondly, he was one of the first, after Currie, to carry out in a systematic manner the refrigerant treatment of typhoid fever, his first use of it having been made in 1847; and finally, his results have scarcely been surpassed. Unfortunately, he includes in his tables cases of typhus fever, which were treated in the same manner as the typhoid cases. It is therefore impossible to estimate his results with accuracy. When, however, it is recalled (1) that the average mortality of typhus fever in adults is at least as great as that of typhoid; (2) that no children were treated; (3) that the number of typhus cases bore a small proportion to that of the typhoid,—it must be conceded that his results, considering that his patients were all hospital cases, and therefore in many instances far advanced before treatment was instituted; it must, I say, be conceded that his results are unusually good, even from the therapeutic standpoint of to-day.

There were, in short, only 6 deaths out of the 141 cases treated by Le Roy in 1847–51; *i. e.* 1 death in $23\frac{1}{2}$ cases. Of the 141 cases, 23 were typhus, so that, proceeding on the improbable assumption that all the deaths occurred in the typhoid cases, there would be 118 cases with 6 deaths, or 1 in $19\frac{2}{3}$. At the present day no physician would admit that the bleeding in the early stage of the disease was in any way conducive to this favorable result. On the contrary, the verdict would be unanimous that the success achieved was due to the refrigerant treatment and occurred in spite of the bleeding.

The Brand Method.—The cold-bath treatment of typhoid fever is indelibly associated with the name of Brand,[1] who was the first to reduce it to what may fairly be called a mathematical system. In the evolution of his ideas on this subject three distinct periods can be traced. In his first publication, in 1861, he formulated his results in the statement that if typhoid fever be treated with cold baths from the commencement, there is, as a rule, nothing to be feared, and even in the gravest cases a cure may often be obtained. In 1863 he becomes more positive: his method of treatment has been adopted and endorsed by others, whose results have equalled his own. He now writes that every case of typhoid fever treated regularly by his method runs a mild course, and fatal cases are scarcely ever encountered. In 1868 the method is systematized in every respect, and has been widely employed throughout Germany. Brand now declares that the methodical treatment of typhoid fever with cold baths from the onset of the disease renders a cure certain; and Glénard of Lyons, who intro-

[1] *Die Hydrotherapie des Typhus*, Tübingen, 1877.

duced Brand's method into the hospitals of that city in 1873, is equally positive as to its efficacy. So far as I am aware, such claims have never been advanced in favor of any other method of treatment, either of typhoid fever or any other zymotic disease. It therefore deserved the fullest investigation. Before, however, calling attention to certain criticisms of the Brand method which have been made with apparent justice, as well as pointing to certain contraindications against its employment, I will state briefly its technique:

The temperature of the bath should be from 18° to 20° C. (64.4° to 68° F.); it should last fifteen minutes, and be repeated every three hours so long as the rectal temperature exceeds 38.5° C. (101.3° F.). In hospitals it is most convenient to place the patients in a ward communicating directly with a bath-room, to which they may be conveyed in a wheeled chair. When this is impracticable, a portable bath on wheels may be brought to the bedside, surrounded with a screen, and the patient placed in it. The entire trunk and all the extremities should be immersed, leaving only the head uncovered. As soon as the patient is placed in the bath, water still colder than that which it contains should be poured over his head, usually for the space of a minute. This affusion seems to lessen the shock of the cold plunge, and especially the respiratory embarrassment which at first accompanies it. It is scarcely necessary to say that the physician himself or a trained and intelligent nurse should personally supervise every detail of the bath, and that the patient during his immersion should be watched with the greatest care. In the course of a few minutes he will present the principal signs of a chill, such as rigor, chattering of the teeth, and paleness or blueness of the lips. These may be prevented or mitigated by friction of the upper extremities and thorax, for which purpose a "loofa" may be used. If the signs of chill are well marked, as they generally are at the expiration of ten minutes, a few tea-spoonfuls of a strong wine, such as port or sherry or a good claret or burgundy, or brandy and water, should be administered and a second cold affusion applied to the head. The patient is now removed from the bath, enveloped in a sheet which is covered with a blanket, and replaced in bed, without any attempt to dry the skin. He may then be given a little hot soup or a few tea-spoonfuls of undiluted wine. The bed-covering should be light, in order to protract the effect of the bath as long as possible.

It cannot be denied that this mode of treatment is repugnant to many patients, but the relief it gives them is often so great that after the first few baths instead of objecting to its continuance they will demand it. In general terms, the disagreeable sensations produced by the bath are in inverse ratio to the stage of the disease and the degree of pyrexia; or, in other words, the earlier the stage of the

disease and the higher the temperature the better is the bath supported. (See article on Hydrotherapy, Vol. I.)

The chief objections to Brand's method are—first, that to obtain the best results from it it must be instituted before the fifth day of the disease; *i. e.* at a time when it is often impossible to establish the diagnosis with certainty; and, secondly, that it is applied to all cases indiscriminately. It seems impossible to rid the mind of the idea that the cold bath in fever is an heroic proceeding, and therefore to be reserved for the severest cases. The latter objection is met by the statement, undoubtedly correct, that the mode of invasion of typhoid fever affords no certain prognostic data, cases apparently of mildest type at the beginning often terminating fatally by intestinal perforation or other complication, while others whose onset is attended with the gravest nervous symptoms may end in recovery. In fact, it is not until about the twelfth day that the febrile symptoms, either by persisting, augmenting, or diminishing, enable one to hazard a prognosis as to the result. With reference to the first objection, it is of little importance practically that an occasional diagnostic error is made and cases of ephemeral or malarial fever are treated with superfluous heroism, for it is well established that in fever generally the cold bath is not only innocuous, but beneficial.

Outside of Germany the cold-bath treatment has not been generally adopted. In France it was first employed in Lyons in 1873, where it was introduced by Glénard, who was taken prisoner during the war of 1870 and sent to Stettin, where, for five months, he had the opportunity of observing the method as practised by Brand himself.[1] From July, 1873, to January, 1874, 53 cases were treated in two hospitals at Lyons, the Croix-Rousse and the Hôtel-Dieu, with only 1 death. This result was the more striking as the general mortality from typhoid fever in Lyons during 1873 had been 26 per cent. In 1874 there was a severe epidemic of typhoid fever at Lyons, and the authorities of the Hôtel-Dieu gave their medical staff every facility for carrying out the cold-bath treatment; so that for a time the daily average number of baths in that institution amounted to 600. Still, the number of cases was too large to permit of all being treated by the Brand method, and only the severest were selected for this purpose. Out of 518 cases admitted, 228 were treated with cold baths—a number certainly large enough to afford a satisfactory test of this or any other mode of treatment. Of these 228 cases, 25 died, a mortality of 10.9 per cent.: 290 cases were treated at the same time and place by the medicinal methods at that time in vogue ("*par les méthodes habituelles*"). Of these, 29 died, a mortality of 10 per cent. Notwithstanding the figures, this result was decidedly favorable to the cold-

[1] E. Chapuis, *Thèse de Paris*, 1883.

water treatment, which, as already stated, was only applied to the gravest cases.

The subject was next investigated by the Société des Sciences Médicales, which appointed a commission for the purpose. Circulars containing questions as to mode of treatment, etc. were sent to every physician in the city, but were answered by only thirty-nine. The reporter of the commission, M. Mollière,[1] was, however, able to collect 750 cases. Of these, 300 were treated by the Brand method, with 25 deaths—about 9 per cent. The other methods of treatment gave a mortality of 5 per cent.

The report also stated that under the cold-water treatment complications had been less numerous and less severe than under treatment by the ordinary methods. The contradictions involved in this statement are so glaring as to deprive these statistics of credibility, for it is equivalent to saying: the fewer and the milder the complications the greater the mortality. The report was not accepted by the society, and Mollière himself continued, in spite of it, to employ the cold-bath treatment in his own practice. The explanation of the inconsistencies in Mollière's report is found in the small number of those who replied to the circular above referred to. It was based on very incomplete data, as is shown by the fact that while 262 deaths from typhoid fever occurred in Lyons during the epidemic, the commission had official knowledge, through the circular, of but 64.

This investigation, if such it can be called, although manifestly imperfect, taken in connection with the natural prejudice against the cold-bath treatment, had the effect not only of preventing its general employment, but of discouraging those who had regarded it favorably. About the same time also opinions adverse to the claims of Brand were published by Péter[2] and Raynaud[3] of Paris, the former of whom expressed himself to the effect that in therapeutics generally, and especially in the treatment of typhoid fever, the best system is to have no system. Raynaud also reported two fatal cases treated by Brand's method, the treatment having been instituted before the seventh day, and declared that nothing could be falser than Brand's statement that all cases of typhoid fever treated with cold baths during the first week would infallibly recover. These and other obstacles to the general use of the Brand method in France have thus far proved insuperable.

In England, owing to the stand taken by the leaders of medical thought, it has fared no better. In 1879, in the course of his celebrated address on the treatment of typhoid fever, Sir William Jenner expresses himself in the following carefully guarded manner: "The treatment of typhoid fever by cold baths when the temperature reaches 104°, or

[1] *Lyon Médical*, vol. xxii. pp. 219, 262. [2] *L'Union médicale*, 1877.
[3] *Bullétin général de Thérapeutique*, tom. xci., p. 487.

even less, is very generally adopted in Germany; but neither my own limited experience nor the evidence adduced by others in its favor has carried conviction to my mind of its advantage. At the same time, I entertain no doubt that the direct cooling of the body is in some cases essential to the preservation of the life of the patient—gives him, so to say, his only chance of recovery; while in others it alleviates the severity of a symptom which increases the danger of the patient."

In the following year Cayley[1] expresses himself more decidedly in its favor. He believes it impossible to doubt that this mode of treatment considerably diminishes the rate of mortality, which, formerly decidedly lower than that in the German hospitals, is now (1879) more than double.

In 1887, Collie,[2] writing of the Brand method, says that the existing data do not sustain the claims that have been made for it. At the time of the appearance of Collie's book Brand's latest statistics were not published, but they are now the chief "existing data" to which all advocates of his method appeal. They are given in the course of a series of articles in the *Deutsche medicinische Wochenschrift*, 1887. Brand, having at that time an experience of thirty years in the treatment of typhoid fever with cold baths, positively declares that every case treated according to his directions, the treatment beginning before the fifth day, will recover. In support of this remarkable statement he offers the following figures:

Jürgensen (Tübingen)	217 cases,	1 death.
Vogl (Munich)	221 "	6 deaths.
Military hospital (Stralsund), 1877–82	257 "	1 death.
Military hospital (Stettin), 1877–82	186 "	3 deaths.
Brand (private practice)	342 "	1 death.
	1223 cases	12 = 1 per cent.

Not one of these twelve deaths occurred in a case that came under treatment before the fifth day.

In this country the Brand method has not been widely employed, although the opposition to it, if such it can be called, has been almost entirely passive. The obstacles in its way are the same as were encountered in England, and are traceable to the fact that the leading practitioners of the large cities have been discouraged by the results of an imperfect application of the method or have had no experience of it whatever. Quite recently a considerable number of cases have been treated in this manner at the German Hospital of Philadelphia by J. C. Wilson[3] and others, with most encouraging results. Wilson treated 40 consecutive cases with cold baths, all recovering; at the same time

[1] *Croonian Lectures on Typhoid Fever*, London, 1887.

[2] *Fevers*, Philadelphia, 1887.

[3] *Medical News*, December 6, 1890.

he treated 10 cases "either upon the expectant method or by means of carbolized iodine." . . . . "Of the 10 cases treated according to the old method, 1 died, the patient being a man aged thirty-three years, admitted at the end of the second week of the attack, and already suffering from an intestinal hæmorrhage. Death occurred on the third day after his entrance to the ward." This last case should scarcely enter into the comparison of the two modes of treatment, for it is doubtful whether any one but Brand himself would have had the temerity to treat it with cold baths. Wilson's term of service at the German Hospital, during which the cold-bath treatment was pursued, terminated on July 15, 1890. His report was published on November 4th, and in the interim the same method of treatment was pursued by his colleagues, Drs. Trau and Wolff, 24 additional cases having been treated without a death. "The statistics of the German Hospital, then, as regards enteric fever, are from February 1, 1890, to November 4, 1890, 64 cases treated by the cold baths without a death."

Dr. D. J. M. Miller has recently introduced the Brand method into the Episcopal Hospital of Philadelphia. In reply to my inquiry as to his results and impressions, he tells me that about 20 cases were treated strictly with cold baths every three hours while the temperature registered 101½° in the mouth or 102° in the axilla. There were 3 deaths—2 from intestinal perforation, 1 from pneumonia. In one of the cases the perforation "seemed to be caused by the bath—*i. e.* it occurred while the patient was in the tub; and in the other the relation was not so close." The 3 fatal cases were admitted at a late period of the disease—1 on the fifteenth day; another on the sixteenth, and the third on the seventeenth. Every case treated before the fifth day recovered, "and not only recovered, but seemed to lose the ordinary signs of typhoid fever"—*i. e.* there was no diarrhœa, no tympany, no dryness of tongue, and very little headache or other nervous symptoms. Dr. Miller, whose cases will be reported in full, declares himself to be most favorably impressed with the cold-bath treatment. Although his cases are not numerous, they are important as representing the kind of patients which the hospital physician is called upon to treat. In my experience it is rare for a patient with typhoid fever to be admitted to a hospital during the first week of the disease, so that neither the Brand *nor any other* method has fair play in these institutions. Miller's cases, added to those treated at the German Hospital, brings the number up to 84, which, with 3 deaths, gives a mortality of about 3.6 per cent.[1]

[1] I have made no attempt to collect all the cases treated by cold baths in this country. Among the first, if not the first, to introduce this mode of treatment into the United States was Dr. Robert T. Edes, formerly of Boston, now of Washington. Edes' cases were treated at the Boston City Hospital from 1872–74, and are reported in the

Unprejudiced consideration of the Brand method causes two facts to stand out prominently: 1. The statistics of cases in which it has been rigorously applied are far more favorable than those of any other mode of treatment. A physician may treat 40, 50, or even 100 cases, without a death by careful hygienic and dietetic measures, aided by drugs of undoubted efficacy, but who, except Brand and his disciples, has treated 1200 cases with a mortality of 1 per cent.? 2. It cannot be thoroughly carried out in private practice until it has been generally tested in hospitals, with results surpassing those of any other method of treatment; but to ensure the acceptance of these results by the profession the cases on which they are based must be counted by the thousand. Statistics based on fifty, or even a hundred, cases are only of value to the physician who has treated them. To him the experience acquired by their study is invaluable, chiefly because no two of them were alike; but for that very reason their statistical importance is slight. In large statistics the various influences which in a small epidemic might turn the scale in favor of or against a special mode of treatment are cancelled by the presence of their opposites, so as to leave the balance to be decided by therapeutic measures alone.

Antipyretic Drugs.—The cold-bath treatment, when successfully carried out, is believed by Brand to dispense entirely with drugs, although some of his disciples continue to employ them as adjuvant thereto. The objection to the use of antipyretic drugs is that they do not lower the temperature without at the same time producing a depressing effect upon the system. In cases treated properly from the beginning they are rarely necessary, and should always be regarded as secondary agents to be reserved for emergencies of hyperpyrexia in which the cold bath cannot be promptly procured or fails of its usual effect. The chief of these drugs are quinine, salicylic acid and some of its salts, and the coal-tar antipyretics, especially antipyrine and acetanilid (antifebrin). The least perturbating and the least efficacious of these drugs is quinine, which, to produce an antipyretic effect, must be given in doses of one scruple to half a drachm or even more. We are largely indebted to Liebermeister[1] for our knowledge of the antipyretic action of quinine and the proper mode of prescribing it in typhoid fever. This well-known clinician directs that the entire amount be given in the evening, in fractional doses of 50 centigrammes (7½ grains) each, and at intervals of ten minutes, so that in the course of half an hour, or at the most of one hour, the desired amount be admin-

Medical and Surgical Reports of that institution for 1877. The plan adopted by him was that of Ziemssen, the patient being placed in water of 100° F., which was gradually cooled down to about 70°. His conclusions are that "of 32 patients in three different years, *where a clear diagnosis of typhoid fever in the first week is admissible*, only 1 died."

[1] *Ziemssen's Cyclopædia*, vol. i.

istered. It is given in what is practically one dose, because the elimination of quinine from the system is so rapid that thirty or forty grains distributed in small doses throughout the twenty-four hours would have little or no antipyretic effect; and the evening is selected as the time for its administration, because the maximum effect of a massive dose of quinine is not obtained until after the lapse of from six to twelve hours. In other words, when given in the dose and at the time specified by Liebermeister the antipyretic action of quinine coincides with the natural tendency of the disease toward a morning remission. So impressed was Liebermeister with the advantages of this mode of treatment that, writing nearly twenty years ago, he declared that, notwithstanding his high estimate of the cold-water treatment, and his positive conviction that it would be wrong to treat a severe case of typhoid fever without the systematic abstraction of heat, he would, if forced to the unpleasant alternative of choosing between cold water and quinine, in the majority of cases select the latter. Whether or not he has since modified this statement I have been unable to ascertain.

With reference to the preparations of quinine, either the sulphate, the hydrochlorate, or the hydrobromate may be prescribed; and as to its mode of administration, it may be given in solution, suspension, capsule, or cachet. I prefer to give it in suspension in the case of children, and in capsule to adults. A gelatin capsule should, however, never be given to a patient who is taking whiskey or other alcoholic stimulant, for the effect of the alcohol in the stomach is to harden the capsule and render it more or less insoluble. If the quinine causes vomiting, as it not uncommonly does, it may be given with equal efficacy by the rectum, either in suppository or in suspension with a few drops of tincture of opium. Owing to the discovery of more powerful agents the antipyretic use of quinine has fallen of late years into abeyance. This neglect is, however, undeserved, and is not unlikely to be atoned for by its cautious resumption.

Salicylic acid and its salts have not commended themselves to the profession. They are believed by many practical physicians to exert a depressing effect upon a heart already laboring under the combined effects of a specific bacterial poison and a high temperature.

The same is true of antipyrine and acetanilid, although there are cases in which I have used them with decided benefit. He who is aware of the possible danger attending the use of these powerful drugs is least likely to incur it. The rapid fall of temperature produced by these remarkable agents has been, in some instances, attended with an alarming state of collapse. The best safeguard against such accidents is moderate dosage. Fifteen grains of antipyrine given in the course of a half hour, in doses of five grains each, are, as a rule, sufficient to produce a decided effect, and I possess a temperature-chart which shows

that on several occasions five grains of acetanilid caused a defervescence of from 4.5° to 5° F. On another chart a fall of nearly 6° (from 103.6° to 98°) was effected by the same dose. I have frequently seen a decided impression upon the temperature produced by doses of 2.5 grains of this substance.

Digitalis is another drug which deserves mention under this head, if for no other reason than because it was highly esteemed as an antipyretic by the late Dr. Murchison. In medicinal doses it stimulates the vagus and lessens the rapidity of the heart's action. At the same time it induces contraction of the small arteries, and so raises the arterial and diminishes the venous pressure. This heightening of the arterial pressure is said to be more marked in the internal vessels, especially those of the mesenteric system, than elsewhere; "hence the blood is diverted from the heat-producing to the heat-dissipating organs, and consequently the temperature falls." It is a remedy which should be used with great caution, especially when the myocardium is degenerated, as it is so apt to be in late stages of typhoid fever. To produce an antipyretic effect it must be administered in full doses, and therefore, in spite of careful supervision, the undefined boundary-line between its medicinal and its toxic actions may be suddenly and unexpectedly passed.

Intestinal Antisepsis.—Next to antipyresis the most prominent indication in typhoid fever is intestinal antisepsis; in fact, it is a question whether this is not, strictly speaking, the primary indication, for the fever is secondary to processes which have their origin in the gastro-intestinal tract. The discovery that the intestine is a species of laboratory in which are formed poisons capable of aggravating or, as some hold, of originating disease, is the result of the researches of several European observers. In 1870, Selmi discovered, in the body of a man who was supposed to have been poisoned, a substance chemically identical with certain vegetable alkaloids. This discovery might have led to a miscarriage of justice had he not found the same substance in other bodies free from all suspicion of poisoning. Gautier of Paris traced these alkaloids to the putrefaction of albuminous substances—fibrin, for example—and Pouchet, his assistant, next discovered a very poisonous alkaloid in normal urine. A signal service in this connection was rendered by Brouardel and Boutmy, who discovered a test by which these cadaveric alkaloids or ptomaïnes may be distinguished from the alkaloids of vegetable origin. This test may be briefly described by the statement that the ptomaïnes, added to ferrocyanide of potassium and perchloride of iron, yield prussian blue.

The clinical application of the above facts was first made by Bouchard, who began by searching for the alkaloids in the urine in cases of infectious disease. He succeeded in finding them in appreciable

quantities in typhoid fever, pneumonia, infectious pleurisy, and infectious icterus, whereas in normal urine but traces of them could be detected. Later, he found the same alkaloids in the fæces in much larger quantity, and was able to demonstrate that their amount is in proportion to the activity of the intestinal fermentations.

It is now established that these substances, the toxicity of which is thoroughly proved by experiments on animals, are greatly increased in typhoid fever, and it is held by many clinicians that they are largely responsible for the group of symptoms known as "typhoid." This view is corroborated by the effect of certain drugs which, while exerting an antiseptic action on the intestinal contents, mitigate or abolish the symptoms referred to. That these drugs destroy the toxic intestinal alkaloids is a well-known chemical fact—that they exert a most favorable influence upon the course of typhoid fever is admitted by all who have given them a thorough clinical test.

Thymol.—The best of these medicinal agents is thymol. In every case in which I have employed [1] this drug in an early stage of the disease the tongue has become rapidly clean and moist, and has so continued; tympany has speedily subsided or has never made its appearance; diarrhœa has diminished, without being followed by constipation; there has been no delirium; and, finally, the temperature has gradually subsided and remained within moderate bounds. In a word, my experience has convinced me that the typical symptoms of typhoid fever will rarely develop if thymol is administered during the first week of the disease. The virtues of thymol are explained on the principle of intestinal antisepsis. In the first place, its antiseptic power is four times greater than that of carbolic acid, and its poisonous effects ten times less. Secondly, it is so insoluble as to reach the small intestine, and there exert its powerful antiseptic effect. As I have elsewhere stated, the fact that thymol is an intestinal disinfectant is proved by the disappearance of phenol from the urine of those to whom it is administered. This substance is one of the most constant products of intestinal decomposition, and is eliminated for the most part by the urine, where it is found even in health; and experimental therapeutists regard its amount in that fluid as a test of the efficacy of an intestinal antiseptic.

Owing to its insolubility and its pungent, burning taste, thymol must be given in pill form. There are theoretical objections to prescribing pills in typhoid fever, but practically they are without foundation, especially if the pills be freshly prepared. The best excipient for thymol is medicinal soap. As to the dose, I have never given more than 40 grains in twenty-four hours—two $2\frac{1}{2}$-grain pills every three hours—and usually give but half this amount. It has, however, been

[1] *Transactions of the Association of American Physicians*, 1888.

given with perfect safety in much larger doses; for example, by Bozzolo as a vermicide in cases of ankylostomiasis, in amounts of nearly ten grammes (ʒiiss) daily. In prescribing thymol the patient should be directed to swallow several mouthfuls of water after each pill to ensure its rapid passage through the fauces and œsophagus, for if arrested in these parts it gives rise to a very disagreeable burning sensation. This is the only precaution to be observed in its use, but it is an important one. I prefer prescribing thymol in gelatin-coated pills, provided alcohol is not taken at or near the same time, for, as already stated, the effect of alcohol upon gelatin is to harden and render it insoluble.[1]

Naphthalin.—This is another intestinal antiseptic of approved value, for the use of which in typhoid fever we are indebted to Rossbach, whose claim that it has an abortive effect on the disease has been recently supported by the observations of Wolff of Philadelphia.[2] The latter recently treated 100 consecutive cases with naphthalin at the German Hospital, with a mortality of 10 per cent. Of the patients, 56 were males and 44 females; their average age was 24.7 years, and the mean duration of the febrile period was 24.4 days. "A notable fact is that in the 100 patients so treated 16 cases ran an abortive course—*i. e.* they defervesced before the end of the second week." Although there were 10 deaths in this series of cases, Wolff claims that the mortality did not, in reality, represent more than 2 per cent. of those treated with naphthalin, for the reasons that 2 cases were comatose on admission and died three days later, and 4 succumbed to complications—viz. facial erysipelas, glosso-pharyngeal paralysis, acute pulmonary phthisis, and heart failure, the result of valvular disease. "Of the 4 remaining cases, 2 died respectively within four and five days after admission, never having responded to treatment." Wolff believes that the undoubted antiseptic effect of naphthalin is due to its conversion into naphthol in the intestine. This chemical change is supposed to be effected by the agency of hydrogen peroxide, which is constantly present in the small intestines.

Recent researches of Sehrwald,[3] however, corroborate the view of Fischer, that the disinfecting power of naphthalin is not so much due to the solid drug as to the gas which it freely evolves at the body temperature.

The dose of naphthalin, like that of thymol, is not a fixed quantity. In cases of intestinal catarrh Kraemer[4] obtained excellent results with

[1] I have recently ascertained that DaCosta employed thymol in the treatment of typhoid fever in 1883, prescribing it in from ½ to 1 grain doses. (See *Transactions of the College of Physicians of Philadelphia*, 1882, p. 234.)

[2] *Medical News*, May 23, 1891.

[3] *Berliner klin. Wochenschrift*, 1889.

[4] *Ibid.*, Jan. 18, 1886.

daily doses of 1 gramme (15 grains), whereas Wilcox[1] believes that failure in similar cases has been due to insufficient doses, and declares the administration of less than 60 grains daily to be a "needless waste of a very good medicine."

During the use of naphthalin the urine becomes of a dark, almost black, color, but this fact is of no evil significance. It should, however, be predicted to the nurse and patient. As to any unpleasant effects from the drug itself, these are almost invariably due to the fact that it is impure. When administered with ordinary care the worst that can happen is occasional burning pain in the urinary passages, and to refuse to employ the remedy on that account would be, to quote Rossbach, about as sensible as to banish iodine and potassium iodide from therapeutics because now and then they give rise to acute coryza and palpitation of the heart. Naphthalin may be given in powder or capsule or suspended in mucilage. Finely-ground coffee is a good vehicle when it is prescribed in powder. It may be advantageously prescribed in starch capsules, with a little oil of bergamot to conceal the unpleasant odor, as suggested by Wilcox and as previously employed by Rossbach.

Calomel.—At the present day this is the only purgative that is given with the object of producing a specific effect upon the course of typhoid fever. For this purpose it is usually given as recommended by Liebermeister—*i. e.* three or four 8-grain doses are administered in the course of twenty-four hours and at an early period of the disease, before the stage of intestinal ulceration has been reached. The effect of this medication is, naturally, to produce free purgation, which, however, soon subsides. Calomel is not contraindicated by the presence of diarrhœa. Liebermeister's statistics demonstrate that calomel exerts a favorable effect upon the course of typhoid fever, lessens its duration, and diminishes its mortality. Most of those who prescribe calomel in typhoid fever probably do so on account of its purgative action, by which offending material is expelled from the intestine; while others are content to employ it because it has been empirically proved to be beneficial. Late bacteriological researches have enabled us to give a reason for our faith in this drug by proving it to be an intestinal antiseptic. A series of experiments performed in the laboratory of Hoppe-Seyler by Wassilief[2] demonstrated calomel to be both antiseptic and aseptic in its action—*i. e.* it not only prevents the development of micro-organisms in culture media, but destroys those already present. It has, however, no special influence upon fermentations, such as the digestive, produced by the action of unorganized ferments or enzymes.

Sehrwald has shown that calomel and naphthalin do not destroy the

[1] *St. Louis Med. and Surg. Journal*, 1887, March.

[2] *Zeitschrift für Physiologische Chemie*, vol. vi., 1882.

same microbes in the intestine of typhoid patients, but exhibit decided preferences in this respect. Naphthalin is especially inimical to the bacillus of Eberth, while the other fæcal bacteria are attacked by calomel. The inference, especially of those who, like Sehrwald, regard typhoid fever as due to a mixed infection, is that both of these drugs should be administered as early as possible in the course of the disease.

Salol, charcoal, iodoform, creasote, iodine, carbolic acid, sulphocarbonated water, and still other substances have been used, and, it is claimed, with benefit, as intestinal antiseptics in typhoid fever. They are, however, in my opinion, inferior for various reasons to thymol, naphthalin, and calomel. An intestinal antiseptic, according to Bouchard—and there is no better authority—must be more or less insoluble and exert no toxic action on the organism. This definition excludes salol, which no sooner comes in contact with the alkaline secretions of the intestine than it splits into carbolic and salicylic acids, both of which are rapidly absorbed; as well as all the other substances last mentioned, except charcoal, which to produce an antiseptic effect in the intestinal contents must be employed in practically impossible doses.

Mineral Acids.—The testimony in favor of the beneficial effect of the mineral acids is decidedly convincing, and is in strict accord with our knowledge of the digestive function and its febrile derangements.

The well-known antiseptic property of the gastric juice is probably wholly due to hydrochloric acid, which substance is either greatly diminished or entirely absent in general febrile states and in gastric catarrh. Now, in typhoid fever we frequently have a combination of fever and catarrh of the stomach, and under such circumstances the food must either be predigested or its digestion rendered more effective by the administration of hydrochloric acid. If food passes from the stomach into the intestine without having been acted upon by the gastric juice, it will certainly undergo abnormal fermentations. These may be prevented by the administration of HCl, which, therefore, may be regarded as an indirect intestinal antiseptic. I am in favor of the routine administration of this acid in typhoid fever, not because I believe it to exert any specific action on the course of the disease, but solely to supply a defective ingredient of the gastric juice.

Turpentine.—This substance, at one time much employed in this country in the treatment of typhoid fever, has been supplanted by more effective agents. It was in great part owing to the impressive teachings of the late Professor George B. Wood that turpentine came into such general use in this disease. Wood believed it to exert a specific effect on the intestinal ulcerations, and found his chief indications for its employment in a dry brown tongue with marked abdominal symptoms. In a case properly treated from the beginning these

symptoms are scarcely ever seen, so that, admitting the efficacy of turpentine, the field of its action should be very limited.

Nitrate of Silver.—Although this drug has not been proved to possess an antiseptic action upon the intestinal contents, and, on account of its great solubility and ready decomposition, must be excluded from the class of intestinal antiseptics as defined by Bouchard, it has been given, with apparent success, to accomplish the same object for which those agents have been so successfully administered. One of the first to employ nitrate of silver in typhoid fever was Joseph Bell[1] of Glasgow. "In some very bad cases," he says, "I have used with advantage nitrate of silver, in doses of from 1 to 3 grains, made into a pill with crumbs of bread, and given every six or eight hours." He evidently considers this treatment to partake of the heroic nature, for he continues: "Such patients are placed in a desperate condition, and require energetic treatment to prevent their destruction." Whether he succeeded in preventing it does not appear. Trousseau employed nitrate of silver in typhoid fever merely to combat diarrhœa, giving it in doses of 1 centigramme every hour. Probably no one has had so large an experience with this drug in typhoid fever as Professor William Pepper of Philadelphia, who some years ago treated a series of 100 consecutive cases without a death. In reply to my inquiry concerning these cases, Dr. Pepper, in a letter dated April 25, 1891, has kindly given me the following details: "The series was of 100 cases treated in private practice, and there was not a single death. Most of the cases were seen at the very onset, though a certain proportion were seen in consultation after the disease was fully established. In all cases nitrate of silver was administered from the earliest moment at which the nature of the disease was suspected until the entire close of the process. It was nearly always given in pill form and in doses of one-fourth and one-fifth grain. If there was diarrhœa a small dose of opium was combined, and if the bowels were quiet or disposed to be constipated a small dose of belladonna was substituted. Absolute rest and strictly liquid diet were insisted upon. These constitute the staple of the treatment. In certain cases alcohol, quinine, turpentine, or carbonate of ammonium were given to meet special indications. High temperature was relieved by occasional large doses of quinine or by cool sponging. The series extended over a considerable period, and many of the cases were of great severity."

In a later communication Dr. Pepper says: "I have been so fully convinced of the value of nitrate of silver as a constant element in treatment of typhoid fever that it has for many years been my invariable practice to employ it from the earliest hour that I see a case in which there is even a suspicion that it will prove to be one of that dis-

[1] *Glasgow Medical Journal*, vols. vii., viii., and ix., 1860.

ease. I continue its use throughout the entire course of the case. It is very rarely that I abandon it. I do not hesitate to associate with it any other remedy as indications may require. I can say with confidence that I have never lost a case of typhoid fever in private practice, where I have been called at the beginning of the disease, since I have adopted this treatment. This statement covers a period of at least ten years, and of course refers to a very large number of cases, although I am sorry to say I have allowed myself to be drawn into so many collateral matters that I have been prevented from keeping proper records."

It will, of course, be observed that this remarkable success was achieved in private practice, and that Dr. Pepper makes no allusion to his hospital cases, which during the period referred to must have been very numerous. Still, making all allowance for the great advantages of early treatment and previously good physical condition, which are the chief characteristics distinguishing private from hospital cases, it must be admitted that his favorable results are largely due to the hygienic, dietetic, and medicinal treatment to which his patients were subjected.

Alcohol is no longer given as a matter of routine in typhoid fever, but only to meet special indications, which, as a rule, do not arise before the end of the second week. The previous habits and age of the patient are the chief factors in determining whether alcohol is to be given or not. Most persons under thirty years of age, previously temperate, if placed under proper treatment during the first week will do better without alcohol. The previously intemperate require decided doses of alcohol from the start, which must be increased, as a rule, as the disease progresses. Patients over forty years of age, of previously temperate habits, will generally be benefited by a moderate amount of wine or whiskey during the entire course of the disease. By a "moderate amount" I mean about three ounces of whiskey—half an ounce every four hours—during the twenty-four hours. In all cases attended with marked nervous symptoms, such as low, muttering delirium, subsultus tendinum, and restlessness, alcohol should be tentatively prescribed, and continued or not in accordance with its effects. If the patient becomes more tranquil under its use, and especially if the pulse, previously rapid, soft, and dicrotic, gains in volume, strength, and tension, and loses in frequency, its action is undoubtedly beneficial. No rule universally applicable can be formulated with reference to the administration of alcohol in typhoid fever, although it seems to exert its favorable effects more frequently when the skin is moist, or even "leaky," than when it is hot and dry. It matters little in what form the alcohol be administered, although I have a preference for good, sound whiskey. When there is a decided tendency to looseness of the bowels a wine rich in tannin should be substituted for the whiskey.

Treatment of Complications.

The principal complications of typhoid fever are referable to the digestive system, and include excessive diarrhœa, tympany, intestinal hæmorrhage, and perforation of the bowel.

A moderate diarrhœa need not be interfered with. By "moderate," as here employed, I mean from three to six gruel- or mush-like stools in the twenty-four hours. If the number exceeds six, and especially if the discharges become watery, measures to control them should be adopted. Among the most efficacious means for this purpose are opium suppositories, acetate of lead, gallic acid, nitrate of silver, sulphate of copper, and salicylate of bismuth. Of these drugs I have found the last in 5-grain powders every three hours decidedly the best, and this I attribute to its well-marked antiseptic properties.

I have not seen, in my own practice, a case of typhoid fever with excessive meteorism for several years. When, however, this complication has been allowed to supervene, it may best be treated by the application of cold compresses to the abdomen, and by charcoal and alcoholic stimulants internally. These failing, an enema of cold water may induce contraction of the intestinal parietes at the same time as it mechanically dislodges and expels some of the accumulated gas. As a last resort a rectal tube may be carefully inserted and pushed upward as far as possible.

Intestinal hæmorrhage is best combated by the administration of ergot, both *per os* and hypodermically, and also by the application of ice-cold compresses to the abdomen. While extract of ergot is given hypodermically, astringents, such as acetate of lead and gallic acid, may be given by the mouth. At the same time, all warm drinks should be withheld, and absolute bodily rest maintained.

Perforation of the bowel calls for the use of large doses of opium, after the plan originally advocated by the late Professor Alonzo Clark of New York. There is no rule as to dose, the drug being pushed to the point of tolerance. A grain of opium, or its equivalent in morphine, may be given every hour until the respirations are decidedly reduced in frequency; for example, to twelve per minute or even lower. At the same time, all nourishment is withheld except water, and this only in the shape of small pieces of ice occasionally. In case of recovery the bowels should be kept confined for a week or more after the symptoms have subsided. The only authenticated recoveries from perforation of which I have any knowledge were treated with opium. Laparotomy for this accident is, I believe, useless. I am hardly prepared to call it unjustifiable, but I believe the chances of recovery, slight as they are, are greater under purely medical treatment. Besides, there is always the possibility of a mistake in diagnosis, for peritonitis arising in the course of typhoid fever may be due to

other causes than intestinal perforation; for example, to direct extension of inflammation from the base of an ulcer, to hæmorrhagic infarction of spleen or kidney, or to rupture of a softened mesenteric gland. The peritonitis resulting from such accidents has doubtless been frequently attributed to perforation of the intestine.

Hypostatic congestion of the lungs is the most frequent complication of typhoid fever, and is due to the combined influence of a weak circulation and a recumbent posture. It is best avoided by frequently changing the position of the patient, so that his decubitus shall be, on the whole, rather lateral than dorsal. Deep respirations, such as are taken in cold baths on the first shock of entering them, as well as those induced by cold sponging, are the best prophylactic and curative agents as regards this condition. In addition, the strength of the circulation should be maintained by stimulants judiciously employed, as well as by strychnine, which, in doses of from $\frac{1}{30}$ to $\frac{1}{50}$ grain three or more times daily, is an excellent cardiac and respiratory tonic.

Pneumonia or pleurisy occurring in the course of typhoid fever I regard as intercurrent affections rather than complications. Their treatment under these circumstances demands more strongly than usual the judicious use of stimulants and the avoidance of depressing measures, among which I include blisters.

The complications involving the circulatory system are cardiac weakness, hæmorrhage, and thrombosis. The strength of the heart's action is best indicated by the duration, the pitch, and the intensity of the first sound. When the two sounds of the heart closely resemble each other—*i. e.* when the duration of the first sound is shortened and its pitch raised—it is evident that its strength is failing, but whether from the mere strain of long-continued over-exertion or from granular degeneration of its fibres is not always easy to determine. If after a few doses of stimulants the normal relation of the two sounds is restored, the condition is probably chiefly due to fatigue; if, however, the heart's action continues rapid and feeble after the use of stimulants, and especially if there is little difference in the character of the two sounds, it is highly probable that some degeneration of its muscular fibres has occurred. This condition is completely recovered from with time, although it may manifest itself by undue cardiac irritability for months after recovery. It is claimed, and with apparent justice, that cardiac and other parenchymatous degenerations are prevented by a properly-conducted antipyretic treatment.

The most constant form of hæmorrhage is epistaxis, which is best controlled by the application of ice-cold compresses to the bridge of the nose and forehead, and by injecting astringent substances into the nares. A solution of alum or tannin is usually efficacious, and excellent results have been obtained by the injection of pure lemon-juice. Internally

or hypodermically, ergot may be given at the same time. These measures failing, the posterior nares may be tamponned, but it is extremely rare for this *dernier ressort* to be necessary.

Thrombosis, like pneumonia, is rather an intercurrent affection than a true complication. Like the pulmonary congestion, it is caused by the sluggish state of the circulation, and therefore requires the same prophylaxis. It is limited, as a rule, to the large veins of the lower extremities, and is much more common on the left side than on the right. This is explained by the fact that the left common iliac vein is crossed, and presumably compressed, by the right common iliac artery. Thrombosis is a late accident, not appearing before the third or fourth week, or, more commonly still, during convalescence. Its treatment consists in absolute rest and hot fomentations, followed, when pain and tenderness have subsided, by bandaging. It is completely recovered from, as a rule, but the danger of the detachment of a fragment of clot and its embolic obstruction of the pulmonary artery is always present in the early stages of the affection.

Parotitis is treated on general surgical principles. It is believed by Strümpell that this accident may be prevented by careful and repeated cleansing and disinfection of the mouth, from which cavity he believes the germs of inflammation and suppuration find their way along Steno's duct to the parotid gland.

Mental disturbances occasionally manifest themselves during convalescence, and may persist for an indefinite period, although their duration is, as a rule, not more than one month. It is very rarely the case that the derangement lasts longer than three months. Complete restoration to mental health is the rule in these cases.

I say nothing about the management of bed-sores, because their existence is proof positive of defective medicinal treatment and careless nursing. A bed-sore has no legitimate place in the clinical history of typhoid fever. It is neither a complication nor an intercurrent affection: it is a blunder.

Management of the Stage of Convalescence.

Péter has said that the convalescent stage of typhoid fever may almost be regarded as a disease by itself—"presq'une seconde maladie;" and, so far as its management is concerned, this is undoubtedly true. It is at this time that the patient, beginning once more to feel himself "his own master," is himself mastered by the imperious demands of appetite. In a hospital with well-trained nurses the management of this stage is a comparatively simple matter, but in private practice, where the physician has so often to deal with the indulged and the self-indulgent, his tact and patience may be tried to their utmost.

The stage of convalescence may be said to have fairly begun when the evening temperature has reached the normal point for two successive days, the morning temperature being also normal. Even before this period the patient may have been clamorous for solid food, receiving instead nothing but "fair words," which are proverbially insufficient articles of diet. The time has now arrived when the diet of a healthy man is to be gradually resumed. In addition to the milk, which still constitutes the staple article of diet, a poached or soft-boiled egg may be allowed for breakfast and a little milk-toast for supper. The next day the egg may be repeated in the morning, some chicken-broth, thickened with well-boiled rice, given for dinner, and some corn starch for supper. The patient, if all has gone well, is now perfectly ravenous, and the third day may combine the egg and milk-toast at breakfast, and be allowed the soft parts of six or eight oysters at dinner, with the addition of a glass of sherry or half a tumbler of ale. In the evening the inevitable milk-toast is repeated, and between these meals milk may be taken *ad libitum*. A little boiled chicken may be added next day or a sweetbread, and thus by degrees the approaches are made toward the much-wished-for mutton chop, beefsteak, and mashed potatoes. The latter articles, however, should not be permitted until the temperature has remained normal for about ten days, the interim having been filled up with chicken, fish, sweetbread, partridge, and eggs in various culinary forms.

As to the time of sitting up, it is a safe rule to keep the patient in bed for a week after the temperature has reached and remained at the normal point.

During the first three weeks of convalescence—and even much later when the attack has been unusually severe—the temperature and circulation of the patient are characterized by great instability. Even the act of digesting solid food at first causes the temperature to rise. I have repeatedly observed this *febris carnis*, as it has been called, and I would suggest that it be called *febris cibi*, as solid food of any kind may occasion it in the first week of convalescence.

The patient is also extremely emotional at this period, and therefore all news of an exciting character should be withheld from him as long as possible. Every day of tranquillity brings him greater strength to bear the inevitable burdens of life.

Convalescence is often promoted by stimulants, even in cases where they have not been administered during the fever. A glass of burgundy, or, better still if relished, a mug of Bass's ale or Guinness's stout, is one of the best of tonics at this time. A convalescent from typhoid fever is always anæmic. The condition of the blood is similar to that which obtains in chlorosis, but this does not necessarily imply that the deficient hæmoglobin is to be restored by the administration

of iron. If the digestion is good the patient will soon assimilate all the iron he needs from the beef and mutton he is devouring. If the anæmia continues, a change from the city to seashore or mountain should be advised, and may be combined with the use of iron internally. A ferruginous mineral water is the best vehicle for iron under these circumstances.

I have made no reference to the numerous affections that have been described as "sequelæ" of typhoid fever, nor do I intend to do so, because the majority of them have nothing to do with the so-called primary disease, except that they follow it. It is undoubtedly the fact that the convalescent stage of typhoid fever is one of great physical susceptibility. The exemption from one infectious disease that has been conferred upon the patient is at the price of a temporary increased liability to other affections.

In concluding this article, which I have limited to a description of the principal methods now in vogue in the treatment of typhoid fever, I can heartily indorse the quotation with which Dujardin-Beaumetz ends his chapter on the same subject: "*The best treatment of typhoid fever is a good physician.*"[1]

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[1] "Le meilleur traitement de la fièvre typhoïde est un bon médecin."

TYPHUS FEVER.

By MANUEL DOMINGUEZ, M. D.

Typhus, petechial fever, or *tabardillo* as it is commonly called in Mexico, is a contagious febrile disease, endemic over nearly all the country, with exacerbations of an epidemic form occurring at the beginning of summer and in winter; a disease that gives to the person attacked by it a probable future immunity; that is developed with some symptoms similar to those observed in typhoid fever, and in every way identical with those exhibited by the contagious ship- or jail-fever of the English, but the essential cause of which is entirely unknown.

I call this fever contagious, contrary to the opinion entertained by many of my colleagues, who absolutely deny it that character; and to that of others, who, while admitting the classical distinction between infection and contagion, place it only among infectious diseases, or, at most, regard it as infecto-contagious. In my opinion, contagion is characterized by the transmission from one organism to another of a special miasm. This organic element has the property of thriving in the new field, of multiplying itself, of giving rise to the same disease of which it is the characteristic germ, and of never losing this power of self-transmissibility. On the other hand, infection consists in the absorption of a miasmatic agent which lives, develops, and dies in the new organism to which it has been transmitted. Bearing this distinction in mind, typhus fever and allied affections may properly be placed among contagious diseases, while intermittent fevers, for example, may be classed among the infectious disorders.

Having said that typhus is endemic throughout Mexico, I will further state that its special habitat is in that region of the country known as the Central Tableland. In regard to this point M. Jourdanet has asserted before the Mexican Academy of Medicine that *typhoid* fever, and *not typhus*, is the disorder most commonly observed in Yucatan, the most prominent symptoms being those of a severe diarrhœa and other intestinal lesions; that the same may be said of the fever occurring in the state of Tabasco and along the coast of the Gulf of Mexico; and that, in his opinion, all those towns situated on the sea-level prob-

ably nurse the same affection. In support of this idea the distinguished observer just mentioned added that "typhus fever, in the eastern portion of the country, only reached as far as Orizaba, without even penetrating Vera Cruz," pointing to the curious fact that "the two types of febrile disorders most common in this part of the world, typhus and yellow fever, each exercise a power over a certain territory, one never invading the dominion of the other."

Be this as it may, I will affirm that over its own territorial dominions typhus fever occurs in the country as well as in the large towns, and in the rural districts surrounded by the purest air as well as in the filthy alleys of the most uncleanly city.

Typhus fever in the Mexico of to-day is not of modern origin. There is no doubt that the ancient epidemic called by the Mexican Indians "*matlazathuatl*," and which produced such terrible ravages during the years 1546, 1576, and 1736, was caused by no other disease than petechial fever of an entero-hæmorrhagic form. According to Torquemada, 800,000 Indians succumbed to the disease in 1546, this figure being increased to 2,000,000 during the year 1576. From those remote periods to the present time the frequent transmissions from one organism to another have diminished greatly the virulence of the contagion. Even in its periodical exacerbations, during which the fever assumes an epidemic form of a greater or less severity, the mortality is comparatively small. During the epidemic of 1812 the mortality was 60 per cent., which, added to political convulsions, produced a high death-rate among the inhabitants. In the years 1813, 1814, 1823, and 1839 even the relative recrudescences of typhus fever produced great alarm in all classes of society, notwithstanding the fact that the number of deaths had already largely diminished. At present the endemic form of the disease, occurring at the seasons previously referred to in this article, has a mortality varying from 20 to 25 per cent. among those attacked by it, including persons of all ages and sexes, and one of from 50 to 60 per cent. when the disorder takes an epidemic course. I may here mention that the mortality is always greater among the higher classes of society, and it seems as if the scourge were a sworn enemy of civilization.

The germ peculiar to this disease is yet to be discovered. Notwithstanding the earnest studies and profound researches of many of our most eminent investigators, the true nature of the cause of the fever remains at the present time entirely unknown. There undoubtedly exists a special miasm; but is this the result of organic animal decomposition? or, as Montano believes, is it the same micro-organism that causes the different types of intermittent fever? The existence of many well-authenticated cases of spontaneous typhus fever opposes both theories, while there are other cases still in which it is impossible

to attribute the disease to any cause. It is not rare to meet with healthy individuals, of previously sober habits and faithful observers of the strictest rules of hygiene, suffering with typhus fever, in whom the terrible disease plays havoc, exhibiting in the most severe form all its characteristic symptoms and signs.

Among the predisposing causes of typhus fever may be mentioned —1. Insolation, especially when the individual exposed has allowed damp clothing to dry on his body; 2. Indigestion, in which case the presence of the disease may be attributed to an auto-infection. 3. Overcrowding of people in close apartments vitiated with a foul atmosphere; 4. Impure drinking-water; 5. Decomposed food; 6. Cadaveric emanations; 7. Miasms originating in water-closets, cess-pools, or other similar sources.

All these causes give rise to typhus fever, but if it is remembered that in many instances persons exposed to them remain free from the disease, it may be held, reasoning *a priori*, that a certain predisposition peculiar to the individual organism is absolutely necessary for the development of the special typhus germ.

In Mexico the indigenous race, ill-fed and almost nude, uncleanly from lack of education, subject to the direst poverty and a hard-working-life, exposed almost constantly to the inclemency of the weather, or obliged to inhabit small, badly-ventilated, damp, and pestilent huts,—such a race, I repeat, has lost its robust physique and vigor of old, and degenerated into a people of a feeble constitution, so that they are adapted to the ravages of all infectious disorders.

Typhus fever, as I have already remarked, can be transmitted by direct or indirect contagion—that is, by personal contact—through the medium of the different secretions, such as the breath, the sweat, and the fæces, or through the clothing and the surrounding air. This transmissibility is not to be compared to that of other zymotic disorders, such as measles, scarlet fever, and small-pox, but there is no doubt that typhus fever occurs similarly, if we notice the many cases reported in our medical literature. This mode of transmission, however, is denied by certain biassed observers in whose opinion evidence itself has no weight.

With a few variations typhus fever has the following onset: A more or less intense chill, assuming at times an intermittent form; great physical depression, accompanied with general *malaise;* supraorbital cephalalgia, usually lasting to the end of the second week; stupefaction and vertigo; a more or less pronounced anorexia; wakeful sleep; and an abrupt elevation of temperature, which is always increased toward evening. Sometimes there are nausea and vomiting, and pain over the abdomen is frequently complained of. In the majority of cases epistaxis is present, and generally appears on the third day after the infection.

These signs exhibit a decidedly progressive course, but neither their intensity nor their persistence is sufficient to characterize the disease under consideration. On the fifth day after the invasion, marked by the initial chill, the peculiar typical eruption appears. This eruption may be considered as an unequivocal, pathognomonic sign of the disorder. From this moment, which may properly be looked upon as the period of effervescence, the train of symptoms may be described as follows: Stupid expression of the face; marked injection of the conjunctiva; a frequent pulse, ranging from 100 to 120 per minute; a dry, burning skin, with a surface temperature of from 40° to 41° C. (104° to 106° Fahr.); a broad, whitish, and decidedly dry tongue; ringing of the ears and deafness; constipation (diarrhœa in exceptional cases), and a concentrated urine diminished in amount; mental wandering or total indifference of the patient toward everything that surrounds him; painful spots over the abdomen, and on the epigastrium the existence of the characteristic eruption in the form of petechiæ. These petechiæ were by Jimenez likened to flea-bites, from which they may be differentiated, however, by the absence of the central hæmorrhagic point produced by the insect, and by being slightly elevated. This eruption may properly be compared to that of rubeola. The spots momentarily disappear on pressure; from the third to the fourth day they are transformed into true petechiæ, and persist from the sixth to the tenth day. From the hypogastrium, on which this exanthema first appears, the eruption gradually spreads over the body, with the exception of the face, the palms of the hand, and the soles of the feet, becoming more and more confluent, and finally taking the form of irregular patches. *Pari passu* with the appearance of this eruption, there is exhaled by the patient a special characteristic odor—an odor which my great teacher, Jimenez, was in the habit of comparing to that given off by the domestic mouse. That observer considered this peculiar odor of paramount importance, as he was never able to perceive it in those fevers which accidentally assume the typhoid form.

This train of symptoms increases in severity from day to day. The lips and the teeth in the course of time are covered with sordes; the tongue, which acquires a cylindrical shape, appears dry and is covered by a brownish coat. The meteorism caused by inertia or paralysis of the intestines increases, and the constipation becomes more pronounced. The expulsion of urine is involuntary or the liquid is entirely retained, the bladder becoming enormously distended. The epistaxis, which may at times be overlooked, is present, and often so abundant as to require tamponing of the nasal fossæ. The petechiæ, signs of capillary hæmorrhage, and produced by the blood in a state of decomposition, are now found in different parts of the body, especially on the trunk. The temperature is high, 39° to 41° C. (102°

to 104° Fahr.), with a slight morning descent. The frequency of the pulse ranges from 100 to 140 per minute. Then there comes delirium, sometimes of a tranquil character, marked by a slight disturbance of intellection; at other times it is exalted, furious, simulating an acute attack of mania, revealing a clear perversion of the cerebro-spinal functions. This ataxic form of typhus fever is the most dangerous, producing the greatest number of deaths, these being usually preceded by a profound coma. The most common form of the disease, however, is the adynamic type, occurring ordinarily in old people and debilitated adults. It is characterized by profound collapse, a compressible pulse, the frequency of which bears no relation to the temperature. These symptoms are followed by certain ataxic movements, dependent, however, on the adynamic condition of the patient, and by a perceptible coldness of the surface of the body, which is progressive till the occurrence of death.

In children typhus fever exhibits a special form. It is usually characterized by a period of invasion, in which the following symptomatology is noticed: cephalalgia, more or less elevation of temperature, and complete prostration. In the second period, or that of effervescence, the eruption is temporary, presenting a discrete form, but sometimes it is totally absent. In the second week a frank convalescence, without complications, sets in.

In adults, even if ataxic phenomena should appear during the course of the second week, typhus fever has a tendency to assume the adynamic form, and death often occurs on the disappearance of the fever—at a time, indeed, when it is expected that convalescence should begin.

As is the case with the enteric fever of Europe, in Mexico typhus fever is frequently complicated with pulmonary congestion—a condition which lacks the importance and severity pertaining to that of the first-named disorder. There is sufficient reason for the belief that this congestion in typhus is wholly hypostatic, owing to the tendency of patients to assume the dorsal posture.

In typhus fever, it is safe to assert, constipation is the rule, but this does not entirely exclude the existence, at times, of diarrhœa, especially during the last stages of the disease, when the evacuations become involuntary.

A very rapid pulse is an unfavorable symptom. Jimenez used to say that "there is no worse augury, in the advanced period of the disease, than a concentrated pulse, the frequency of which gives to the beating artery under the finger the character of a soft and loose cord in continuous vibration."

In fatal cases delirium is frequent, but this is absent in the benign form of the disorder. It is worthy of note that this delirium is not

generally of a wild nature. When spoken to under such circumstances the patient will answer intelligently, as if mind and judgment were in a normal state. The delirium and subsequent coma are sometimes accompanied with spasms. If these spasms continue and become generalized, they point to a fatal termination.

The gurgling sound in the right iliac fossa, so frequently observed in typhoid fever, is extremely rare in typhus; it is only noticed when the patient is purged or when diarrhœa is present. In such cases this gurgling sound is observed not only in the right iliac fossa, but also in other regions of the abdomen; which clearly shows that it is produced by the conflict, so to speak, between the liquids and gases contained in a tube that has for some reason or other lost its physiological tonicity. The symptom should by no means be considered as pertaining to typhus fever. The eruptive spots are so frequent and appear in such great numbers that the designation of *petechial* fever, given to the disease by many authors, is not a misnomer. The eruption, it is true, is absent in some cases. Thus in 1886, Liebermann observed in Mexico instances of this nature, and such he pronounced cases of abortive typhus. My friend, Dr. Ollogui of San Juan del Rio, has made similar observations. This fact, nevertheless, in no way diminishes the diagnostic value of the typical eruption. When this sign lacks at the beginning the exanthematous character of the typical roseola, but, on the contrary, presents the petechial form, the prognosis of the disease is unfavorable.

Not uncommonly there occur in typhus fever gangrenous eschars of the skin, especially at the points of most constant pressure, but these accidents are less frequent than in typhoid fever. A more serious accident, and one more frequently met with in typhus than in enteric fever, is gangrene of the abdomen, and of the vulva in women, produced by arterial and venous thrombi resulting from an extremely impoverished condition of the blood.

During the course of the disease the catamenial period may come before its proper time; sometimes it appears as a critical phenomenon. In pregnant women typhus fever is apt to produce abortion or induce premature labor, which are dangerous accidents.

Perforation of the intestines, the subsequent peritonitis, and alvine hæmorrhages are unknown in typhus fever.

The ordinary duration of typhus fever is fourteen days; it rarely goes beyond the twentieth or twenty-fifth day. The difference is noticeable when compared with the enteric fever of Europe, the duration of which is at least thirty days. If our disease passes from the second to the third week without amelioration of the symptoms, the prognosis is exceedingly unfavorable. In the fatal types of the disorder death takes place during the course of the second week.

Typhus fever, whatever the form in which it appears, is always a serious disease. Even in the most benign types accidents are apt to occur that compromise the life of the patient. It is for this reason that the prognosis should always be guarded.

The train of symptoms already described, and the pathological lesions which are found post-mortem, are sufficient to make of typhus fever an affection distinct from follicular enteritis. I hold that there is a certain relationship between the two disorders, but the Mexican *tabardillo* appears to be more closely allied to the *typhus fever* of Edinburgh.

Escobedo and Jecker in the early history of our National School of Medicine, and later on our eminent Jimenez, Hidalgo y Carpio, Ehermann, Jourdanet, my colleague Carmona y Valle, and others, all accept the difference between the two diseases, but these authors are not concordant in explaining the difference. Thus Jourdanet took into consideration the various meteorological conditions of the localities in which the infection originated; Jimenez laid stress on the geographical differences between the continents. Some writers have pointed to the distinct character of the races, while still another class of authors have attributed to each of the two diseases a particular germ as the cause.

Without wishing to place myself on record in regard to the character of the miasm, whether it be the same for the two diseases or a distinct one for each, I am, however, inclined to believe in the latter, basing this belief on the fact that both affections coexist in our soil. This would not be the case if one and the same pathogenic germ were simply modified by our peculiar climate or by the idiosyncrasies of the individual economy receiving it. Again, a person once attacked by our *tabardillo* does not remain exempt from an attack of typhoid fever and *vice versâ*.

Finally, I will state, in support of the duality referred to, that the difference between the two pyrexias is noticeable from the onset of the symptoms. In typhus fever the invasion is violent, marked by a chill; in typhoid there is no chill, as a general rule, and the prodromic period is prolonged. In this latter affection diarrhœa is the rule, while the former is characterized by constipation. Typhus fever lasts commonly two weeks; typhoid fever goes beyond the thirtieth and frequently reaches the fortieth day. In *tabardillo* convalescence makes its appearance in a rapid manner, while in its homologue it comes by lysis. The cutaneous eruption is the most prominent sign of typhus fever; in typhoid fever all other signs are subordinate in importance to the peculiar lesion of the intestinal follicles.

As typhus fever is a highly contagious disease, the miasmatic germ of which is readily transmitted from one person to another through the

atmosphere, the secretions and excretions, the clothing, etc., it is absolutely necessary, in the first place, to isolate the patient and place him under the best hygienic conditions as regards ventilation and cleanliness. It is at the same time advisable to make free use of disinfectants. Curative measures have been as varied as the different theories proposed regarding the origin of a disorder unknown in its very essence. At one time the method of Brown, which consisted in the administration of analeptic agents or invigorating tonics, served only to overcrowd the graveyards. It was followed by the still more terrible depletory medication of Broussais. This so-called founder of the Physiological School laid a great deal of stress upon the intestinal lesions characteristic of typhoid fever. Our own practitioners of those times, incapable of understanding or appreciating the difference in the essential pathological changes between the two diseases, typhus and typhoid, and considering, besides, the ataxic form of *tabardillo* as an active hyperæmia or inflammation of the nerve-centres, adopted with unbounded faith and enthusiasm the therapeutic plan of the illustrious medical reformer. General and local bloodletting, a vesicant and evacuating treatment, united to the severest diet, became then the remedial system universally adopted in the management of the disease in question. The day came, however, in which the eminent physician Manuel Carpio, by combating energetically and successfully the therapeutic absurdity referred to, rendered a great service to suffering humanity. This great man introduced and advised an evacuating and sudorific medication—a practice which became generalized during several years, but was afterward converted, unfortunately, into a routine system.

The general plan observed to-day in the treatment of typhus fever is that proposed by Hidalgo y Carpio, and called by this observer the "rational expectant treatment." This method consists in combating the symptoms as they appear, being especially careful in keeping up the strength of the patient, in order to render him capable of successfully resisting the natural evolution of the pyretic disorder. In fact, typhus fever is at present unknown in its cause, and is, besides, such an insidious foe that it is not always advisable to use against it the same weapon; on the contrary, the weapons employed should be changed according to the manifestations exhibited by the disease. The evacuating method has the following indications: The catarrh of the stomach, which is frequently observed in many cases at the beginning of the affection, should be managed by emetics, especially by ipecacuanha, which is an innocent drug and does not depress the strength of the patient. Constipation and meteorism can be relieved by means of the mechanical and saline purgatives, as these produce no irritation of the bowels and only give rise to a moderate amount of intestinal action.

The ataxic phenomena require the action of the depresso-motors. These agents consist of the antispasmodics, such as valerian, musk, and the bromides of potassium, sodium, and ammonium.

For all adynamic symptoms no better remedies than tonics can be used. Among these may be mentioned quinine and nux vomica, the diffusible stimulants, such as alcohol, which should be given in small doses, and the various wines.

In the special management of hyperpyrexia antipyretic measures are employed. These may consist in the application of tepid- or cold-water baths, and of those general lotions and certain medicinal agents the chief action of which (like antipyrine, for instance) is to reduce an elevated bodily temperature. If the fever occurs in the form of intermittent exacerbations, the salts of quinine are to be preferred, as their effects are both antiphlogistic and antiperiodic.

To render still more clear the therapeutic indications so briefly stated, the following points are to be borne in mind: Contrary to the belief of previous observers, who made the use of purgatives a routine practice, these agents have no special depurative action upon the economy. Such medicaments are employed simply to remove the existing constipation and to relieve meteorism, and as derivatives for certain accidental pathological processes (such as cerebral congestion), and, finally, to avoid the auto-infection to which the patient is exposed owing to the absorption of the alvine discharges retained for a long time within the intestinal tract.

The tepid- or cold-water baths and the general rubbing of the body by means of a sponge act as powerful depressors of calorification. In many cases these measures have given surprisingly good results. The thermometer, it is perhaps needless to say, should indicate the proper time for the application and duration of the bath. Those who systematically use cold water in the treatment of typhus fever keep the patient in the bath-tub until the thermometrical column begins to descend. He is then placed between sheets. If after this procedure the temperature rises, the patient is again submerged. If necessary this is repeated again and again until the abnormal bodily heat is subdued.[1] This method, barbarous though it may seem, and extremely trying to those applying it, has nevertheless given, I repeat, most excellent results, especially in those towns—like the city of Morelia, for instance—where it is very commonly put into practice. I myself have never been in favor of this form of treatment, and much less to-day when we have other therapeutic means with which to keep down the fever; but I verily believe that in those cases in which the hyperpyrexia is accompanied with excitement and delirium no better measure can be employed than the prolonged tepid-water bath. In the

[1] See article on Hydrotherapy, p. 453, Vol. I. of this SYSTEM.

adynamic form of the disease, however, such baths are contraindicated. In these cases tonics and stimulants readily ward off a fatal termination. Then, again, good wines, quinine, cinnamon-water, and the preparations of strychnine are useful weapons to be employed in the hope of obtaining a complete and brilliant recovery.

My own plan of treating typhus fever, which I have been in the habit of using for several years, does not differ greatly from the one just described and at present in vogue by the large majority of Mexican physicians. In the frank and benign type of the disorder I generally employ the expectant treatment, giving slightly acidulated drinks in order to mitigate thirst directly and indirectly to aid digestion. I use, besides, mouth-washes made up of some alkaline solution. I likewise employ cold-water enemata of a decoction of *Illesebram achyrantha*, a preparation known commonly by our lower classes as *tianguis pepetla*, with the object of clearing out the intestines. I prescribe, then, a light diet consisting of eggs, milk, tea, and meat, being careful not to overload the stomach, with the view to keeping up, as far as possible, the strength of the patient, and in the endeavor to avoid the delirium from inanition not unfrequently observed during convalescence.

In the ataxic form of typhus fever, in which there are high fever and continued excitement, I resort to the application of the tepid bath, more or less prolonged, and I administer every half hour 7 grains of antipyrine, the full effects of which must be carefully watched by the aid of the thermometer.

If, however, the disease shows a tendency to assume an adynamic type, I prescribe, from the start, wine of cinchona, frequently repeated according to the requirements of the individual case, or else I have recourse to the use of the tincture of nux vomica by itself or in combination with the wine. If profound prostration or collapse supervenes, as is often seen in senile cases, sulphate of strychnine hypodermically administered is the remedy to be employed. To this may be added dry frictions or rubbing of the body with alcoholic preparations, and the administration also of nutritious enemata.

I can highly recommend this method of treatment, having derived from it great service; but I must here state, to my sorrow, that often in typhus fever the best plan of treatment fails completely in preventing a fatal issue. Typhus fever is a treacherous disease, and often, even during a mild attack, the patient succumbs suddenly to one or another unforeseen accident.

MALARIAL DISEASES AND DENGUE.

By GEORGE DOCK, M. D.

On the Mode of Action of Quinine.

One of the characteristics of malarial diseases, and the most important to the therapeutist, is their susceptibility to cinchona or its active principles. For this reason it will be useful to consider the so-called specific treatment at length before taking up in detail the rational treatment of the various forms of malaria recognized clinically.

Until within a few years a discussion of the action of cinchona or its alkaloids in a practical treatise would have been unprofitable. Owing to the erroneous theories of the pathology of malaria then prevalent, the best explanation that could be made was that "quinine is an antiperiodic, and nothing more."

Now, however, we have a pretty accurate knowledge of the cause, and are beginning to learn something of the nature, of the diseases in question. Moreover, we are able to recognize positively, as malarial, diseases which were until recently obscure in their pathology and diagnosis, and as positively to exclude others heretofore included under that too comprehensive term. For these reasons it is important that we gain as clear an idea as possible of the mode of action of quinine, so as to use with skill and understanding that remarkable remedy, which becomes more valuable in proportion as it is tested.

The modern explanation of the antimalarial action of quinine is substantially that advanced by Binz more than twenty years ago. That is, that it depends on a poisonous influence over the protoplasm of the organisms which cause the disease; in a word, that it is an antiparasitic.

We know now that the various phenomena of malaria are caused by organisms existing in the blood in such cases, first described by Laveran,[1] but most commonly known by the name given by Marchiafava and Celli[2]—*Plasmodium malariæ*. These organisms belong to the Protozoa, the lowest animal beings. Their exact classification is not yet possible, but in their vital manifestation they resemble the

[1] *Du Paludisme et de son Hématozoaire*, 1891.

[2] See Celli and Guarnieri, *Fortschritte der Med.*, 1889, Nos. 14 and 15, for defence of the name.

monads, the sporozoa, and allied forms. In the blood, and for the most part in the red-blood corpuscles, they carry on a cyclical existence, beginning as spore-like bodies, and going on through an amœboid to a segmenting, reproductive stage. We know from the observations of Golgi, abundantly confirmed, that there is a close connection between certain phases of the development of the parasites and the periodic processes in the affected individual. Some of the morbid changes in malaria are traceable to a direct action of the parasites. Such are the destruction of red-blood corpuscles and pigment-formation. Others, not so easily studied, are probably brought about through the agency of the nervous system.

When an individual with malarial fever recovers, either spontaneously or under the influence of remedies, the following changes regarding the parasites take place: The amœboid or actively-growing forms disappear from the peripheral blood, and only large forms, with a few of the smallest, are left. Among the last to disappear are the flagellate bodies (the crescentic forms not being considered, as they are neither constant nor essential), and although it is not certain, as held by some, that these represent purely cadaveric changes, they, as well as the large non-flagellate free bodies, are prone to exhibit changes unmistakably related to their dissolution. Neither these nor the small forms reach the later stages in the event we are now considering.

In spontaneous or natural recovery we assume that the tissues or fluids, or both, of the host have overcome the parasites, or that the latter have been killed by their own metabolic products. Some or all of these processes must take place with the maturing of each generation of the organisms, or, as Plehn has pointed out,[1] as the parasites increase from ten- to fifteen-fold, the individual would be overcome in a few paroxysms—all cases of malarial infection would rapidly become pernicious. Though the theory of Metschnikoff is not held by all who have made a study of malaria, it is certain that the organisms are taken up by phagocytes—not only by certain of the circulating leucocytes, but by others, and very largely by cells in the splenic and hepatic capillaries, the bone-marrow, etc. In the latter organs, in fatal cases, we find large numbers of parasites, in various stages of development in the red-blood corpuscles, in the cells in question. It seems rational to look on this as simply an exaggeration of a physiological process. The investigations of Quincke show us that red-blood corpuscles which are about to end their existence easily fall a prey to the cells mentioned. Whether the still active and potent parasites are overcome by the phagocytes, or whether, having been weakened by chemical substances, they are taken up as so much foreign matter, at all events they disappear.

[1] *Aet. u klin. Malaria-Studien*, Berlin, 1890.

If the removal is not complete, and a sufficient number grow and reach the reproductive period, the host will have another paroxysm, the severity of which, within certain limits, will be in proportion to the number of organisms. If none are left, there will be no paroxysm. If only a few remain, they may be disposed of before they have time to reproduce in sufficient numbers to set up anew the phenomena of ague. Yet even when all traces of the parasites have been lost for a time, they may still exist in a condition and in a part of the body we do not know, though we have reason to look on the spleen as the dépôt. We know from experience that at periods usually of one week, but sometimes much longer, these latent forms may again assume the active condition.

In the cessation of malarial paroxysms under the influence of drugs some act, we may suppose, simply by increasing the natural resistance of the body. In this way the so-called tonics and some drugs which strongly effect the nervous system may act, and as quinine has both these actions, being in small doses a tonic, in larger doses an excitant, it is not strange that its action has been explained in the same way. When we consider, however, the certainty and rapidity of its action, and remember that the disease formerly known as the *opprobrium medicorum* is through it the one most amenable to treatment, we are forced to abandon that explanation. We are therefore led to consider the theory of Binz, already mentioned—viz. that the drug acts directly on the cause of the disease.

If a drop of quinine solution be added to a drop of blood containing the plasmodium, the characteristic motions of the organisms cease, and the organisms themselves assume a cadaveric appearance (Laveran). It may be objected that in this method of experimentation the influence on the organisms is not a simple one, the blood being acted on by the solution chemically and mechanically. Experiments on the isolated organisms being out of the question, we cannot bring more direct demonstration. There is, however, a legitimate analogy close at hand.

Binz long ago showed that quinine has a marked influence on protoplasm. In his earliest experiments he showed that in a dilution of 1 : 20,000 it killed infusoria—paramecium—signs of paralysis appearing within five minutes after the organisms were exposed to the poison, and complete dissolution in two hours. A remarkable fact was brought out in these investigations ; that is, that quinine was more active than such poisons as salicin, morphine, and strychnine. Quinine was also found to be poisonous to smaller monads, killing them as rapidly in dilutions of 1 : 60 as did corrosive sublimate in the strength of 1 : 180.[1]

The action of quinine on animal contractile protoplasm was demon-

[1] Binz, *Centrabl. f. d. med. Wiss.*, 1867, p. 305.

strated by many other investigators, and Darwin showed it to obtain with vegetable protoplasm in his beautiful experiments on *Drosera rotundifolia*.[1]

The nature of this action of quinine, or the mode in which it is brought about, is not so clear. Quinine deprives protoplasm of the power of absorbing oxygen, forming, according to Rossbach, a combination less easily oxidizable than either substance alone. Whatever be the true explanation, the fact remains that certain organisms are strongly and injuriously affected by quinine, even in small quantities; and although we cannot assume that the Plasmodium malariæ is identical in its vital characteristics with the organisms experimented on, we have no reason, on the other hand, for believing it to differ essentially in its reaction to such an agent as quinine.

A peculiarity of the problem of rendering the parasites harmless is that they exist, so far at least as the active forms are concerned, in the blood-vessels. As quinine circulates in the latter, the dilution in which it comes in contact with the organisms is not so high as would appear at first thought, and the task simpler than if the organisms were to be reached only through the juice-canals. The medium to be poisoned is not the whole body, but only the blood-mass.

Five grains of quinine, circulating in the blood of a man of average size, represents a dilution, in round numbers, of 1 : 16,000; which is stronger, it will be remembered, than that with which Binz paralyzed colpoda in five minutes.

The absorption of quinine takes place rapidly under ordinary circumstances. Kerner found it in the urine in fifteen minutes when given by the mouth to healthy men.[2] Baccelli[3] found that excretion began in twenty-four minutes when the drug was given by the mouth, but in fifteen minutes when injected under the skin or in a vein in patients with malarial fever. Carofolo,[4] using 0.25 gramme, found quinine in the urine in eleven minutes after giving it by enteroclyster, and after fifteen minutes by subcutaneous injection. Although excretion begins early, as shown by these experiments, it goes on slowly. Baccelli found traces up to twenty-two hours after intravenous injections of 1 gramme, and as late as thirty-two, or even forty-eight, hours when given hypodermically. These results, which agree with those of Binz and Kerner,[5] show that the time required for excretion is not much affected by the method of administration, and from Carofolo's experiments it seems that this time depends largely on the quantity given, one-fourth of a gramme being finally excreted in about six hours. Baccelli agrees with the statement of

[1] *Insectivorous Plants.*
[2] *Arch. für Physiologie*, 1870.
[3] *Berliner klin. Wochenschr.*, 1890, p. 489.
[4] *Il Morgagni*, Nov.–Dec., 1884, 735.
[5] *Real-Encyclopædie*, 2 Aufl. Bd. iv., art. "Chinarind."

Manassein, strengthened by the experiments of Welitschkowski,[1] that the existence of fever retards the excretion of quinine. We seem entitled to believe, from all these investigations, that a considerable proportion of quinine which is absorbed circulates for a comparatively long time with the blood.

From what has been said regarding the natural cure of malaria, it is clear, *a priori*, that a highly poisonous solution is not necessary to check the paroxysms of the disease. All that is required is a solution of sufficient strength to inhibit the growth of the organisms, when they will become the prey of the phagocytes. It has been shown by the careful observations of Plehn and Baccelli that in their various stages the parasites vary greatly in their resistance to quinine, and that the phase in which they are most sensitive is the amœboid one, which occurs, clinically, between the paroxysms. These observations I have confirmed in a large number of instances. They agree with a clinical fact to be mentioned later. If quinine be given in this period in a case of simple type, the development of the parasites will be checked and the individual, for the time being, cured. If the parasites are present in widely different stages, as occurs in cases of irregular or mixed type, another paroxysm will follow unless the effect of the drug be continued. A few organisms remaining after the action of the remedy has passed by will usually be disposed of by the natural defences. Yet if this is not complete the subject will run the risk of a recurrence at some later period. At present we know of no means by which we can destroy the latent germs, our best method, learned by common experience, being a sort of continuous sterilization.

The action of quinine in malaria we may accordingly explain on the ground that while the drug is peculiarly destructive to the organisms which cause the disease, quantities sufficient to act on the parasites may be taken by man without serious detriment. It is plain that both these qualities are relative, and it is equally plain that other substances may be found which combine them to a practicable extent, though up to this time none have been demonstrated to rival the cinchona alkaloids in efficacy. It is also clear that in large doses quinine exerts its beneficial effect only by a direct action on the causes of the disease, and does not strengthen the individual against future invasions, except in as far as it prevents the anæmia consequent on any attack.

Many writers have criticised the propriety of calling quinine a specific, most frequently on the ground that it neither prevents relapses nor protects against future infections. The difficulty seems to be a verbal one. So long as we know what quinine can do, and how to use it for producing the result, we may be quite indifferent to the application of words to that process. There is one criticism that at

[1] *Petersburger med. Wochenschr.*, 1877.

present cannot be explained away. That is, that sometimes paroxysms of ague occur in persons intoxicated with quinine. If these cases in future are carefully studied, it will probably be found that the paroxysm really begins before the quinine manifests itself. These cases must be studied, not by subjective symptoms, but by the thermometer and microscope.

The Salts of Quinine.—Of the various salts of quinine found in commerce, the sulphate is the one most used in this country. In Europe the hydrochlorate has the preference, which it seems to deserve on account of its higher alkaloidal strength (81.71 per cent.; sulphate, 74.31) and greater solubility (1 : 21.40; sulphate, 1 : 581). It is said, however, that these characteristics are variable, owing to differences in the quantity of water of crystallization. On the whole, the sulphate, always at hand, usually pure, and of low price, is fully deserving its wide use.

Many other salts have been made and proposed, usually on theoretical grounds. For ordinary antimalarial use they have no superiority over those mentioned. Some of them will be mentioned under other heads.

Dosage.—With the more exact study of malaria in the last ten years, the fact has been fully established that enormous doses of quinine are never necessary. When we consider that the drug is by no means an indifferent substance in the human organism, this is of great practical importance. When the result of administration can be controlled by microscopical examination of the blood, as in hospital use, minimal doses suffice. Otherwise, the same result may be approximately obtained by using the remedy in the manner which ensures its absorption at the best time, and by closely observing the effects.

In an ordinary case of intermittent fever 10 or 15 grains of quinine will almost always check the paroxysms. In more severe cases larger doses will be required. But even in the most severe cases a larger quantity than 40 grains in twenty-four hours will not often be needed. Laveran tells us that even in the most severe cases which he encountered in Algiers he never gave more than 45 grains of sulphate or muriate of quinine in a day, in ordinary cases finding 10 or 12 grains sufficient. This corresponds to the dosage recommended by Hertz[1] and most other recent writers, including those in tropical localities. Although very much larger doses are frequently used in the United States, I am convinced that they are unnecessary, often detrimental, and sometimes dangerous. That many cases are reported in which large doses have been given without bad results may be partly due to non-absorption of the drug. Thus, in severe cases in which

[1] *Ziemssen's Handbuch*, 3 Aufl. ii. Bd.

doses of 30 grains had been given by the stomach, Baccelli was unable to find traces in the urine within six hours.

This is evidently not the place to consider the toxicology of quinine. If the doses I have indicated, and the remarks on the mode of administration given below, are followed, accidents will seldom occur and never be serious. The number of people who have idiosyncrasies to quinine is much smaller than the laity imagine, and many of the effects attributed to the drug are really complications of the disease. Nevertheless, in prescribing quinine for the first time the patient should be questioned as to the existence of any particular susceptibility, and the effect of the first administration observed.

In the case of children the amount is regulated by the ordinary rules.

Adjuvants.—Many substances have been proposed as adjuvants to quinine or to lessen some of its unpleasant effects. The most important of these are piperine and capsicum, and ergot. Piperine has been used as an antiperiodic. It is no longer used in acute attacks, but is useful in chronic cases as a stomachic. The same may be said of capsicum. In Warburg's tincture, so highly praised by Maclean, the increased activity of the quinine seems due to the diaphoretics and aromatics.

Ergot appears to have been first put forward to relieve the symptoms of quinine intoxication by Schilling in 1883. It has been successfully used by a practitioner of large experience in my acquaintance, who combines the powder or extract with quinine in the proportion of one to two. Dilute hydrocyanic acid in large doses (10 minims repeated at intervals of fifteen to twenty minutes) and hydrobromic acid were formerly used for the same purpose. I do not think it advisable to mask the symptoms of mild quinine intoxication, and since I have confined myself to moderate doses have seen no kind of severe effects. (See below, under Idiosyncrasy.)

A very useful practice is that recommended by Kerner, of giving carbonated water during the administration of quinine. By this the absorption of the remedy is assisted and its antipyretic action increased.

Mode of Administration.—In ordinary cases quinine is most conveniently given by the mouth in solid form, and is usually efficient when so given. The practice of taking the powder, not uncommon in some places, has no advantage over less simple methods. Ready-made pills are so frequently undissolved that they should never be used. The compressed pills seem more reliable than the others, but that they cannot be depended on is shown by the experience of DaCosta, who found twenty unaltered pills in the dejections in one instance. Freshly-made, soft pills, gelatin capsules, or wafers offer the best method where a solution is not required. But whenever it is necessary or desirable to have as few obstacles to absorption as possible, or to be sure the

proper quantity is ingested, quinine must be given in solution. It should at all times be so given in the case of very young children, who cannot swallow pills, and in military and hospital practice.

It is unfortunate that this method of giving quinine is deprecated by many on account of the bitterness of the remedy. The taste of quinine, though bitter and lasting, has in it nothing nauseating. Many persons take it from the first without repugnance, and many more soon become accustomed to it. In the case of children, and those who resemble children in their dislike to bitter tastes, the latter can easily be removed by lemon-juice or by chewing a biscuit.

In making up solutions, dilute or aromatic sulphuric acid should be added in the proportion of a drop for each grain, and some such aromatic as peppermint-water be used as a vehicle. More elegant preparations can be made by using syrup of ginger or orange-peel, liquorice, or fluid extract or elixir of yerba santa.

Rectal Methods.—The rectum is often utilized for the administration of quinine, especially in children and others who cannot or will not swallow the drug.

In cases in which it is deemed necessary to give quinine during the febrile stage, or at other times when gastric irritability is so great that the stomach will not retain anything, the rectum is frequently tolerant and the remedy promptly absorbed. Before giving the enema the rectum should be washed out with tepid water, and the quinine, in the dose of from 10 to 30 grains, dissolved with the aid of an acid given in one to three ounces of starch-water, usually with the addition of opium. Unfortunately, tenesmus often comes on very rapidly, so that, part of the quinine being lost, the dosage is uncertain. In view of this, Carofolo[1] recommended high injections, and claimed that he had results almost as good as by the hypodermic method.

Suppositories of quinine have frequently been used. Pick[2] recommends them, especially in pædiatric practice. The suppositories are to be pushed some distance ("several centimetres") above the sphincter when the child is asleep. This method has the same disadvantage as that of rectal injection, and does not seem to be practised to a very great extent.

The Endermic Application.—The endermic method, formerly much used, has fallen into deserved neglect. An alcoholic solution of quinine can often be used with advantage for sponging the skin in children and feeble persons, in addition to other measures.

Insufflations of quinine, which have been practised by Jousset[3] and others, and recommended by Dujardin-Beaumetz,[4] do not seem destined to be much used.

[1] *Loc. cit.*

[2] *Deutsche med. Wochenschr.*, No. 18, 1884.

[3] *Gaz. méd. de Paris*, No. 27, 1874.

[4] *Leçons de Clin. thérap.*

The Hypodermic Method.—In the hypodermic method we have one of the most valuable aids in the treatment of malaria. In pernicious cases, even when the stomach appears to retain it, the remedy is seldom absorbed. In some cases, too, the patients are unconscious and unable to swallow. In these cases no time can be lost. The remedy must be introduced into the system as soon as possible. If we postpone this method until a large quantity of the drug has been given without effect by the mouth or rectum, absorption from these surfaces may come on later with very unpleasant results. It is a patent fact that the hypodermic method is not used to the extent it should be, no doubt largely from a fear of untoward results. Yet the risk of causing pain, abscess, or even gangrene, cannot weigh with the danger of the disease if left to itself or to an expectant or symptomatic treatment. Moreover, the risks to be feared, with the exception of pain, are not inherent in the method itself, but due to some fault in the technique.

In regard to the preparation to be used there is considerable choice. The muriate, here as elsewhere, recommends itself by its solubility and large proportion of alkaloid. It may be dissolved in distilled water, though with ordinary doses hydrochloric acid must be added to effect solution. As the bimuriate dissolves in 0.66 of its weight of water at the ordinary temperature, it is preferable to the basic salt. De Beurmann and Villejean[1] give the following formula for extempore preparation :

℞. Quinin. hydrochlor., gr. xx ;
Acid. hydrochlor. (sp. gr. 1.18), ♏v ;
Aquæ dest., ♏xv.—M.

This solution is limpid, of the consistency of syrup. It becomes brown on keeping, without decomposing. One c.cm. (16 minims) of it corresponds to 50 c.g. (7.7 grains) of the neutral (bi-) muriate of quinine.

The addition of alcohol or of glycerin (Köbner) does not seem to be of great value.

Another preparation which may be used when it can be obtained is the hydrochlorate of quinine and urea, the *chininum bimuriaticum carbamidatum*, as prepared by Drygin and first used by Jaffé.[2] This is freely soluble, and in 55 per cent. solution, as recommended by Jaffé, contains about one-third of its weight of the quinine salt.

Many other salts have been devised for hypodermic use, but none of them possess any advantage over those mentioned. It is, however, by no means necessary to have one of these in order to practise this method. While these are not always accessible, and are comparatively costly, the sulphate can always be obtained. Having had considerable

[1] *Bull. gên. de thérap.*, cxiv. [2] *Ctlb. f. d. med. Wiss.*, 1879, p. 422.

experience with this salt, and after using the others, I have every reason to recommend it for general use.

The solution I use is made in the strength of 10 grains to 1 fluidrachm, so that a hypodermic syringe will contain from 3.33 to 5 grains. A solution double this strength may be used in urgent cases. The capacity of the syringe should always be accurately known. The salt is mixed with distilled water, adding dilute sulphuric acid drop by drop until the whole is dissolved, and then adding water to make the required quantity.

In regard to the locality in which to inject, I have found the buttock, between the great trochanter and tuberosity of the ischium, the least sensitive, and the one in which, should there be a local reaction, least discomfort would be felt. I have never seen swelling or induration in that region. The lumbar region and the upper arm are both favorable places, but the calf is apparently more sensitive than any other part, even when the patients keep the bed.

The injection should always be made as deeply as possible, and on withdrawing the needle the small tumor formed by the fluid should be dispersed by gentle pressure. If more than one syringeful of the solution is needed, it is better to make two or three punctures in different places than to refill the barrel and repeat in the same place.

Quinine injections are always followed by pain, sometimes slight, at other times severe, and requiring the use of hot or cold applications to allay it. I have never found the pain severe enough to require the use of morphine, though I have used laudanum on hot compresses. In some cases slight induration follows, but soon subsides. The addition of carbolic acid has not seemed to lessen the pain or induration.

A large number of authors claim credit for making up solutions with tartaric acid. I made a series of experiments with this preparation; among others, with the assistance of Mr. W. Gammon, interne of the Sealy Hospital. The formula we used was:

℞.	Quininæ sulphatis,	ʒj;
	Acid. tartarici,	ʒss;
	Aquæ dest.,	fʒvj.—M.

We used this in men who were not seriously ill, giving two injections (5 grs. each) a day. It was invariably more painful than any other solution used, and in two cases we had such extensive swelling of the calf of the leg that it was feared abscesses would develop, though they did not.

The bisulphate of quinine is not soluble enough to be used without additional acid by the hypodermic method, so that it has no real advantage over the basic salt.

I have not mentioned heat as a solvent for quinine, as I do not look on it with favor. If it is relied on, instead of the acid the salt is apt to precipitate, making the dose uncertain and not diminishing the risk of abscess.

The dose of quinine for hypodermic use is usually stated to be one-third that by the mouth. I would not make the disproportion so great. In order to get an effect in severe cases I never give less than 10 grains at one time, and repeat it in an hour unless the temperature falls very rapidly. In mild cases, and in the non-malarial cases in which I tested various solutions, I could not see that the symptoms were more marked than when similar doses were given, in solution, by the mouth.

Intravenous Injections—Following the theoretical indication of bringing the medicament in direct contact with the blood and the parasites in it, Baccelli devised a method for the intravenous injection of quinine.[1] This method had been used by physiologists from the time of Magendie, but they used acid solutions, which Baccelli in his preliminary investigations found highly injurious. He accordingly devised the following solution, which, when warm, is perfectly clear:

℞.	Quininæ hydrochlor.,	gr. xv;
	Sodii chloridi,	gr. xiss;
	Aquæ dest.,	fʒijss.—M.

The sodium chloride is added to prevent the destructive effects of water on the red-blood corpuscles. The solution is boiled and filtered before using.

The method of injection is as follows: The veins of the forearm are distended by applying a bandage above the elbow. The needle is then introduced from below upward into a vein, a small one being chosen on account of the lessened risk of hæmorrhage. Usually a vein in the middle of the inner side of the forearm is selected. The syringe used contains 5 grammes (75 grains), and is fastened on the needle before inserting the latter into the vein. Strict antisepsis is practised. Before injecting, the bandage is removed and the fluid then slowly expelled, the operator at the same time looking out for the appearance of a small tumor, which indicates that the needle does not penetrate the vein. The small wound made is closed with collodion.

Symptoms of quinine intoxication, such as bitter taste, dizziness, fainting, small and frequent, afterward full and slow pulse, ringing in the ears, a feeling of constriction, and cool skin, soon come on, but usually disappear in from fifteen to twenty minutes.

As the result of carefully-conducted experiments Baccelli used doses of 1 gramme (15 grains), which gave brilliant results, not only in

[1] *Berlin. klin. Woch.*, 1890, p. 489.

regard to the harmlessness of the operation, but also in the infallible therapeutic results. Among the cases treated were several of pernicious fevers of various types. In no case did recurrence occur within a week. At times the temperature rose as much as one degree (Cent.), but soon fell spontaneously.

In a report on malaria to the second Italian Congress for Internal Medicine[1] Baccelli warned against the general use of intravenous injections, but declared the method to be the most energetic, certain, and rapid in the therapeusis of pernicious malarial fever when the usual channels of absorption fail, provided care is taken to secure the proper technique and faultless asepsis. At the International Congress in Berlin[2] he reported on a total of 30 cases of pernicious fever treated by the intravenous method without a death, whereas out of 16 cases treated by the hypodermic method there were 5 deaths.

I have described this method at some length because it seems of great value. If physicians practising in the regions of the more severe malarial diseases would make themselves familiar with the method by experiments on animals, I have no doubt many lives would be saved.

THE PROPER TIME FOR THE ADMINISTRATION OF QUININE.—The time for the administration of quinine, as given by different authors, varies greatly. In the *Schedula Romana*, issued by the physicians of Pope Innocent X., in which the time and the proportions in which the bark was to be given were pointed out in express terms, the directions were to give it "at the beginning of the febrile chill." Administered in this way, its use was followed by a series of misfortunes, the weightiest being the failure to cure the Archduke Leopold of Austria. The counter-blast of the archduke's physician and the acrimonious literary warfare that followed it form one of the most interesting studies in the history of medicine.

The credit for making known to the profession an improvement in the manner of using bark is due to Sydenham, though both Talbot and Morton seem to have devised similar methods independently.[3] Sydenham gave the bark in the apyrexia. Bretonneau modified Sydenham's method by giving the drug in large doses as soon as possible after a paroxysm; and this method was followed by Elliotson, Graves, Briquet, Trousseau, Flint, Murchison, and many others. In fact, many have considered it dangerous to give quinine during the hot stage. On the other hand, some comparatively recent authorities advise that it be given during the time of pyrexia in remittent fevers. This diversity of opinion can only be explained by assuming that the latter idea has been formed from experience with cases in which the

[1] *Loc. cit.* [2] *Wien. med. Blätter*, No. 42, 1890.

[3] See Sir George Baker, *Med. Trans.*, iii., Art. xiii.

temperature-range was not carefully followed, and that in the cases in which quinine was given during the pyrexia, and which were favorably influenced, the temperature was already falling. So irregular or erratic is the temperature-curve in many cases, and so deceptive the ordinary objective and all the subjective symptoms, that it is only by careful use of the thermometer that the real course of the fever can be made out.

In the experiments of Baccelli, referred to before, the author endeavored to find out the best time for the administration of quinine. His conclusions are as follows:

"1. Quinine, even in doses of 1 gramme (intravenous injections), is not capable of cutting short a febrile paroxysm when given in the beginning, or even three hours before.

"2. Given in the acme, it cannot accelerate the crisis.

"3. Given at the decline or at the end of the paroxysm, it either prevents the next or essentially reduces its intensity.

"4. In subcontinued fevers, which usually offer more resistance, it was found useful to give it as the temperature fell, as the subcontinued usually passed into the intermittent type, with decreasing paroxysms and frequently with rapid crisis."

I have frequently confirmed these statements with quinine given by the mouth or hypodermically in cases carefully observed. The manner in which they confirm certain facts noticed in regard to the parasites, and also the results of extensive and careful clinical experience, is very striking.

Formerly it was sometimes advised that quinine be exhibited at certain periods having reference to the expected chill. This is irrational, because even in cases in which the type is known the chill has no fixed place in the febrile paroxysm, occurring sometimes in the beginning, with the temperature normal; at others near the acme or at a variable time between the two extremes. Besides, in the remittent fevers, in which it is most important to time the administration properly, chills are frequently absent. The time in severe cases should be determined by frequent and careful thermometric measurements. In cases of ordinary intermittent fever the sweating stage is a sufficient guide.

There are still a few writers who advise the withholding of quinine until a few paroxysms have passed, "in order to fix the type of the disease." As this is a matter of no interest to the patient, and not necessary for successful treatment, and as every paroxysm does actual injury, the specific cure should be begun as soon as possible after the diagnosis is certain.

In applying the principles governing the administration of quinine to practice we have a certain amount of license. The best results are

probably obtained in ordinary cases by giving from 15 to 20 grains when the temperature begins to fall, though results equally good may be secured by giving two 10-grain doses, two, three, or even six, hours apart during the decline, or by giving three or four 5-grain doses at intervals of two hours in the same time. It is not advisable to give doses of less than 5 grains unless the intervals are very short.

With patients who are able to get up at once after a paroxysm—that is, as a rule, in intermittents of ordinary severity—the administration may be adapted to suit the convenience of the patient. Thus, if the paroxysm takes place early in the day, so that the temperature begins to fall in the afternoon, the full dose may be taken that day. If the attack comes later, one dose may be taken in the decline, the next in the following morning. If the paroxysm comes late in the afternoon or evening, it will be proper to take the full dose, on an empty stomach, next morning.

If the next paroxysm is missed altogether, the quinine may be withheld. If, however, there is a rise of temperature of more than one degree, 10 grains should be given, when the temperature will fall to normal or below. After this no quinine need be given until the seventh day after the last paroxysm. Although it can be taken with safety for long periods, there is no advantage in it, and as the continued use is often followed by disagreeable nervous symptoms, it should not be practised.

To simplify the foregoing statements, the following scheme may be laid down for the routine treatment of simple cases. It may be altered to suit all other varieties:

First day, in the decline, 20 grains of quinine.
Second day, if necessary, 10 grains.
Third, fourth, fifth, and sixth days, no quinine.
Seventh day, 20 grains.
Eighth to fourteenth days, no quinine.
Fifteenth day, 20 grains.
Sixteenth to twenty-first days, no quinine.
Twenty-second day, 20 grains.

If fever of more than two degrees occurs during this period, a full dose should be given, and the treatment, or at least observation of the patient, prolonged.

Contraindications and Idiosyncrasy.—In a case of malarial fever of more than the mildest degree, when the subject of it cannot leave the infected locality for a healthy one, there is no absolute contraindication to the use of quinine. It must be given, and unpleasant and dangerous effects guarded against by a careful selection of the mode of administration and dose.

In persons known to have a susceptibility on the part of the nervous

system, delirium can be guarded against by giving quinine in small doses at short intervals, and stopping as soon as the first symptoms of intoxication appear. In such cases bromides are very useful. I prefer bromide of potassium or sodium to hydrobromic acid or hydrobromate of quinine, as the dose of each agent can be more readily controlled than when given combined. The bromide should be given in full doses—40 to 60 grains—so as to produce an effect rapidly.

In middle-ear disease it is said that very small doses of quinine are efficient. In one such case that I saw the paroxysms ceased after taking 4½ grains—all the patient could bear. The infection had lasted for some time in the spring, but the blood-examination showed it to be rather mild.

It is hardly necessary to remark that pregnancy does not contraindicate the exhibition of quinine. If quinine ever does produce abortion, as is still asserted by some, it must be only in those women who have a predisposition to that accident. In such cases malarial diseases alone are more prone to cause abortion than is quinine. The harmlessness of quinine, as a rule, in pregnant women is very plainly shown in a valuable paper by Dr. M. Howard Fussell.[1]

Of the many forms in which idiosyncrasy toward quinine expresses itself it is unnecessary to speak in detail. Those caused by small doses, though often unpleasant, and, until recognized, alarming, are never dangerous, while those caused by large doses belong to the domain of toxicology rather than therapeutics.

In this connection the remarks of Von Graefe in reporting his first cases of quinine amaurosis are interesting and instructive. He said:[2] "That large doses of quinine paralyze the optic nerve will not prevent a rational physician from prescribing the remedy where it is indicated. For such a purpose I certainly would not have written these histories. Even if analogous cases are reported, as may happen now that attention is called to the subject, these, in proportion to the number of people who rejoice in the curative effects of quinine, would appear entirely isolated."

Other Cinchona Alkaloids and Substitutes for Quinine.—In the foregoing pages I have used the word "quinine" as a convenient one to represent the active principle of cinchona, and because it is the alkaloid most frequently used. Now that the price of quinine is inconsiderable, the strongest argument in favor of the other alkaloids no longer holds. Of these others, cinchonidine is the next in reliability to quinine, and can be used in some cases in which quinine seems to be unreliable.

Chinoidine has been used extensively, but seems to have no advan-

[1] *University Medical Mag.*, Oct., 1889.

[2] *Arch. f. Ophthal.*, 1857, iii. Abth. ii. p. 396.

tage except that of cheapness. Its chemical composition is not constant; the claim that it does not disturb the stomach, as might have been expected, was not realized; and Husemann's case[1] shows that it is not without danger.

Of the innumerable substances recommended for the cure of malaria, from arsenic to pambotano,[2] none have exhibited all those qualities which make quinine so valuable. Arsenic is now seldom used in acute malaria. To check the paroxysms it must be given in large doses (from ½ grain to 1½ grains daily), and even then is uncertain and of course dangerous. Nevertheless, it occupies an important position in the treatment of malarial anæmia, under which head it will be considered later. Eucalyptol, resorcin, and iodine, the best among the recently recommended substitutes, have not given encouraging results in my hands. Nor can I agree with the advice often given to fall back on one of these when quinine fails. In such cases it is better to scrutinize the method of administration, the diagnosis, and the condition of the patient than to resort to the latest "ague-cure."

The statement so often made in reports on quinine substitutes, that in a large proportion of the cases experimented with quinine had failed, usually gives evidence that the reporter either made a mistake in the diagnosis or did not understand quinine.[3]

In order to make any showing to compare with that of quinine, all claims regarding its substitutes should state—1. That all the cases treated were malarial, as shown by the blood-examination; 2. The type; 3. As nearly as possible the severity, with some indication of the duration.

An experience of my own illustrates the usual result with substitutes for quinine. Nitrate of potash, mentioned by Eichhorst as a remedy for malaria, was reported to be infallible by Sawyer of St. Louis and Hunter of New Orleans,[4] and in a few experiments with vernal intermittents I also was successful. In more severe intermittents and in remittents, however, it failed entirely. In repeating the experiments on mild cases I was again successful, but in the course of the observations I learned, by a mistake in dispensing, that nitrate of sodium was

[1] *Pharm. Zeitg.*, Dec. 16, 1885, p. 967.

[2] For a résumé of the scanty literature regarding this drug see article by Dr. A. E. Roussell, *Phila. Med. and Surg. Rep.*, July 25, 1891, p. 129.

[3] In an enthusiastic report on sunflower as an antiperiodic, based on an experience of *two cases*, both these errors appear. Thus in one case, in which an intermittent appeared in the convalescence of measles in a child of five years, quinine was given to the amount of 6 to 10 grammes daily! The reporter naïvely adds that the temperature rose one degree on the second day, notwithstanding the quinine.—*Arch. f. Kinderh.*, xii. 236.

[4] *Virginia Med. Monthly*, Feb., 1890.

equally potent. Still later, in cases apparently no more severe, it failed entirely.

Before closing this section a word may be said on "tasteless quinine." This is either tannate of quinine or the alkaloid itself. The former is usually employed for making "quinine chocolates," and in prescribing them it should be remembered that the tannate contains only 22.60 per cent. of alkaloid. The alkaloid is sometimes sold mixed with sugar. Its taste is very faint (though it is very readily brought out by acids), and it usually cinchonizes very promptly in sufficient doses. Owing to the difference in density of sugar and quinine, the proportions in the mixture sold are variable.

The Preventive Treatment of Malaria.

Our knowledge of the malarial parasites has thus far not added scientific accuracy to the study of prophylaxis. We do not know where or in what form the pathogenic organisms exist outside of the body, nor have we exact ideas as to their mode of entrance. With other infectious diseases the tendency is to give more prominence to the alimentary canal as the point of entrance of pathogenic organisms, but as regards malaria most authorities look on the respiratory passages as principally or exclusively concerned. Such authorities as Tommasi-Crudeli, Celli, Kelsch and Kiener, and Hirsch consider air as the great medium of infection, whilst Laveran, on the other hand, gives some strong arguments throwing suspicion on potable water. There can be no doubt that both sides are right, but that the relative frequency of each mode of infection varies in different localities. Pending the acquisition of more exact knowledge, we have to rely on the facts brought out as the result of long experience.

Considering the actual loss of time and labor caused by the prevalence of malaria in a country, it would seem as if ordinary principles of economy would lead to the adoption of means for its extermination or limitation at any cost. How little this is attempted is only too evident. Of course in the opening up of a new country to cultivation, in building railroads and canals, especially in tropical countries, such work is out of the question; but there are many districts comparatively old and well settled in which improvements could and should be made. The remains of the extensive works built by the ancient Romans to drain the Campagna, discovered by Father Secchi and Dr. Tucci,[1] show that those people did not trust to cultivation alone to render healthy that once fertile territory. And even if we cannot make every locality absolutely free from malaria, it is evident that a judicious disposition of the soil will always lead to great improvement.

Marsh-lands should either be drained or, by the formation of

[1] Tommasi-Crudeli, *Die Malaria in Rom*, translated by Schuster, Munich, 1882.

ponds or lakes, so treated that overflows, with subsequent drying, be reduced to a minimum. Sometimes the planting of trees is beneficial; at other times it is better to cut down forests and cover the ground with turf. All such works should be done at the times of least prevalence of malaria. It is now generally believed that the eucalyptus, of which so much was hoped, has no peculiar action on malaria. Nor is its rapidity of growth as extraordinary as was alleged. In Italy it was found that the trees were very sensitive to cold and the stems easily broken by the winds. In the Southern United States the trees failed, not only on account of the occasional frosts, but even in places where frosts did not occur, because their small roots did not enable them to withstand the winds common in that part of the country. For that reason the planting of native trees seems more rational. It is probable that the sunflower, as proposed by Maury and used recently in Cuba,[1] could be employed with advantage in drying certain marsh-lands.

Individual prophylaxis will always be a matter of principal importance. When personal reasons make residence in a malarial locality necessary, the mode of life must be so ordered as to reduce to the smallest the chances of infection. Emigration should be so timed that arrival takes place in the least dangerous season.

The house should be, if possible, on a well-drained hill, to windward of swamps or marshes. In warm countries it should be elevated some distance, and the ground under it dry, well drained, and in free communication with light and air. It is best to have an impermeable floor of cement or asphalt under the house.

The mode of life should be so arranged that the individual is exposed neither to the midday sun nor to the exhalations of morning and evening. Fatigue, hunger, and excesses of all kinds, from their known effect in lessening the resistance to infection, must be avoided as much as possible.

Exposure to swamps or deep and unventilated spots, espècially after wet weather and at nightfall, sleeping in the open air, bathing in streams in the morning and evening, are all dangerous. On expeditions the camp should not be made on the banks of streams. In exploring malarial shores the vessel will be the safest place at night. Canalis has shown how the examination of the blood may be utilized in prophylaxis.[2] Men who are to be exposed to unusual risks are to be examined on the eve of expeditions, and if organisms are found put on treatment. This will obviate the discomfort of having a chill away from camp and prevent embarrassment to the expedition. The daily use of the thermometer can also be of great service in prophylaxis. A rise of one or more degrees, not enough to be felt, can usually be

[1] *Arch. f. Kinderheil.*, xii. 1890–91, p. 236.

[2] *Arch. Ital. de Biol.*, t. xiii. fasc. ii.

noted a few days before a paroxysm. Operations like cleaning ditches and canals should not be made in the malarial season.

In regard to clothing no rules can be laid down. It should be so chosen as to permit least risk of chilling the surface.

The bed-room should be dry and well aired. The advice sometimes given, to close the windows at night, is based on a misconception. Impossible in warm weather, it has at no time any advantage, since the aspiration of a room so closed is so great as to bring in currents quite as dangerous as those which enter through larger openings.

The beneficial effects of mosquito curtains in keeping off malaria have been affirmed by Emin Pasha.[1] In many malarial countries they are used as a matter of necessity, and probably act by breaking the force of the air-currents which carry the germs.

In warm climates nothing so rapidly reduces the bodily vigor as an abridgment of the sleeping-time. It should always be avoided in malarial localities.

Food should be so selected as to be nutritious and digestible. Alcoholics, especially the lighter wines, beer, ale, etc., are not contra-indicated in those who are accustomed to them, but are by no means necessary. Coffee and tea are not only useful as tonics, but have the advantage of being sterilized fluids. Drinking-water should always be boiled in malarial localities, and as a rule taken only at meal-time.

Exercise, cheerful company, and variety of occupation are all useful for those exposed to malaria, and a sanguine disposition is probably one of the best safeguards against the disease.

The medical prophylaxis must begin with any slight ailment or any abnormality in the digestive and assimilative functions.

Anæmia especially must be the object of scrupulous solicitude, and be avoided or removed by careful attention to diet and mode of life, with such remedies as may be indicated. Very often this originates, in warm countries, in new-comers, in constipation, due probably to increased perspiration and neglect of exercise. Following this there is diarrhœa, the patient having two or three soft stools every morning. This may last for years, the individual never having formed stools, and, though often appearing well nourished, is more or less anæmic. Bismuth in full doses or a pill of acetate of lead and tannic acid leads to prompt improvement.

In regard to the prophylactic action of quinine, we are as yet without data for forming rules with any pretension to accuracy. While it would be easy to bring forward many isolated instances of protection by quinine, and many examples of its efficacy when used on large bodies of men, there are many who assert that the drug is useless or even dangerous. In endeavoring to reconcile the discordant results of

[1] Stanley, *In Darkest Africa*, ii. 31.

different observers, it is impossible to compare them, from the fact that in some cases small doses, in others large ones, were used; in some cases given daily, in others at short intervals.

The most reasonable view of the subject is that summed up in the *Medical and Surgical History of the War of the Rebellion*, 3d med. vol., p. 171, as follows: "The experience of the war appears to teach that when a command is to be temporarily exposed in a specially dangerous locality, quinine should be used for the sake of such protection as it may give. But when a command is to be stationed for a long time in a malarial section, prevention should be attempted by a judicious selection of the camp-site and avoidance of predisposing causes, while quinine is reserved for the first manifestation of the malarial poison and for specific prophylaxis under conditions of unwonted exposure or anticipation of relapses."

But even when given for the specific purpose mentioned above, the best way to use the drug is not yet agreed upon. It is, however, a subject of such importance that it should be experimentally worked out by giving it in different ways to large bodies of men under identical conditions.

In the mean time, I would advise a method which has good theoretical grounds, and in the hands of Plehn has demonstrated its practical value.[1] Plehn gave one gramme of sulphate of quinine in one dose at intervals of seven days. The experiment was made in some of the most notoriously malarial ports in Batavia on a ship's crew of seventy men, and with perfect results. In making this experiment Plehn was guided by the thought that the virus of malaria requires at least seven days for its development in the body, and that one large dose of quinine in that period would be sufficient to hinder the development of the organisms. Plehn himself does not look on one experiment as conclusive. Both time and dose may be varied.

Arsenic is still used as a prophylactic, and, at least for long-continued use, is to be preferred to quinine. It should be given in daily doses of $\frac{1}{30}$–$\frac{1}{6}$ of a grain of arsenious acid or 4 to 20 minims of Fowler's solution, after meals. It should not be continued for more than two or three weeks at a time, and it must be stopped at once on the appearance of symptoms of gastric irritation.

In view of the results of Tommasi-Crudeli[2] and Huber,[3] decoction of lemon seems to deserve further trial. One lemon is cut in slices, with the skin, three glasses of water added, and boiled to one glass and taken fasting.

In concluding this subject it may not be superfluous to add that

[1] *Berlin. klin. Wochenschr.*, 1887, p. 733.
[2] *Med. Times and Gaz.*, Sept. 6, 1884.
[3] *Philada. Med. and Surg. Rep.*, Jan. 28, 1888.

there is no characteristic or combination of characteristics by which we can recognize a given locality to be malarial, except from the result of exposure. And in malarial regions, owing to the exigencies of practical life, every one will sooner or later exhibit some form of malarial infection. The treatment of these affections must therefore be our next consideration.

Intermittent Malarial Fever.

The treatment of a paroxysm of malarial fever is a matter seldom brought to the attention of a physician. The experienced sufferer lies down until the "fit" has passed, and then takes his quinine according to some rule, and it is only when the disease offers unusual resistance that he seeks assistance. Yet much can be done during the paroxysm, not only in lessening discomfort, but also in diminishing injury.

The first duty of the physician in taking charge of a case of intermittent fever is to ascertain whether it is malarial or not. No matter how clear the history of exposure, how typical the course of symptoms, and how characteristic the appearance of the patient, a close examination should be made, and no specific treatment begun until the diagnosis is certain. It is an every-day experience to see the victims of tuberculosis treating themselves (and sometimes being treated) for malaria. I have seen two cases of mycotic endocarditis treated for long periods on the supposition they were malarial. Less frequently, one of the following diseases may be the cause of error: typhoid fever, relapsing fever, pyæmia, pent-up pus, lymphadenoma, syphilitic fever, urinary fever, morphinism (Murchison[1]), jaundice from obstruction (Ord[2]), gastro-duodenitis, pulmonary catarrh, pent-up serum, forming pus (Musser[3]), gall-stones (Charcot[4]), uterine hæmatocele, and hysteria (DaCosta[5]). With some of these the differential diagnosis is easy. In others the presence of enlarged spleen will make it difficult. In all cases the blood-examination will be decisive.

At the onset of the first symptoms, well known to all who have had malaria, such as pain in the back and extremities, yawning, and the like, the patient should go to bed. No food or drink should be taken, as it will only increase the discomfort of the vomiting which is an almost constant symptom. During the chill the patient should be covered, though an excess of bed-clothing is neither essential nor pleasant. Rubbing the skin, and hot-water bags to the back and extremities, are often very grateful, and in debilitated patients necessary.

[1] *Lancet*, May 3, 1879.
[2] *St. Thos. Hosp. Rep.*, xii. 1881.
[3] *N. Y. Med. Journ.*, 1884, i. 619.
[4] *Leçons sur les Maladies du Foie.*
[5] *Med. Age*, 1890, viii. 529.

See also the Middleton-Goldsmith Lecture of Dr. Wm. Pepper (*Med. News*, March 29, 1890), and Dr. W. Osler on "Fever of Hepatic Origin" (*Johns Hopkins Hosp. Reports*, vol. ii. fasc. i.).

When vomiting occurs, the stomach should be emptied by a draught of tepid water, and if it continues it should be checked by cold carbonated water in small quantities; by counter-irritation over the stomach, either by sinapisms or a towel wet with chloroform; or if severe by a hypodermic injection of morphine.

If the patient is seen early enough, an effort may be made to abort the chill by injecting a full dose of morphine, which, even if not perfectly successful, will lessen the discomfort of the patient.

If symptoms of collapse come on—and they should be anticipated in old or cachectic persons and young children—stimulants must be resorted to. Formerly, brandy, Hoffman's anodyne, aromatic spirit of ammonia, and hot coffee were used, and were certainly beneficial. A hypodermic injection of atropine, $\frac{1}{60}$ to $\frac{1}{30}$ of a grain, will, however, be at once more effective and less disagreeable. At the same time, frictions and stimulating enemata may be used, and if necessary hypodermic injections of ether.

If the cold stage be unduly prolonged, the possibility of the case being one of unusual severity must be borne in mind, and especially so in countries where pernicious forms occur. The prolongation of the cold stage may be due to the presence of undigested food in the stomach. If so, an emetic should be given, preferably one that is not depressing, as warm salt water or herb tea, rather than ipecac.

As the hot stage comes on the patient's covering should be made lighter. The pressing requests for cold water must be refused and thirst relieved by crushed ice.

For the throbbing headache cold compresses may be used and morphine may be given. In my observations on the natural history of malaria, I usually gave as a placebo a combination of morphine and spirit of mindererus, as recommended by Professor Bemus.[1] The mixture used was—

℞. Morphinæ acetatis,	gr. ss–j;
Liquor. ammonii acetatis,	f℥vj.—M.

Of this a table-spoonful was given every hour from the beginning of the fever, and it was very evident that all stages of the disease were passed through with less discomfort than in cases not so treated.

Aconite, recommended by DaCosta[2] for the headache, I have not used. Antipyrine and antifebrin I have found useless in both large and small doses.

Pain in the epigastrium or in the region of the liver and spleen is usually and properly referred to congestion of the respective organs. It is best treated by the application of large mustard plasters.

[1] *Pepper's System*, vol. i. p. 595. [2] *Loc. cit.*

In the sweating stage, as a rule, no pressing symptoms arise. Water may be permitted. If full apyrexia comes on, the patient may change his clothing and go about. If the sweating be excessive, it should be checked by rubbing the surface with hot cloths.

It is in this stage that specific treatment is to be instituted, according to the principles already described. The probable result of this can, to a certain extent, be predicted from the condition of the patient after the paroxysm. If the subjective symptoms are such that the patient voluntarily leaves the bed, expresses himself as well, and the temperature falls rapidly, it is almost certain that no paroxysms will follow the administration of quinine. If, on the contrary, there is a feeling of enervation with headache, nausea, or anorexia, even if the temperature falls to the normal, the possibilities are that another paroxysm will ensue. A recognition of this fact, and the use of the thermometer (if possible, also the use of the microscope), are of great assistance in prognosis and treatment.

Formerly it was supposed that in order to get the proper effect of quinine it had to be preceded by a purgative. This is no longer held, though in very many cases purgatives are indicated by the existence of constipation, coated tongue, and muddy skin, and in this condition calomel is the remedy universally used. It is most frequently given in small, repeated doses, combined with bicarbonate of sodium and, if desired, an aromatic, as the aromatic powder of the Pharmacopœia. If a stronger action be desired, calomel can be given in combination with compound extract of colocynth and an aromatic oil or extract of belladonna. In all cases it should be followed by a saline, such as Rochelle salt or cream of tartar. In cases where it is considered necessary to get a purgative and a specific action at the earliest moment, the calomel and quinine can be given together in pills or capsules. In debilitated persons or those recently suffering from intestinal disease purgation must be practised with caution.

It cannot be repeated too often that in frank cases of malaria there is no contraindication for quinine, and those who wander from symptom to symptom, "getting the patient in condition for quinine," will have disagreeable failures. In cases of short duration, or where the type of the disease is still pure, the treatment laid down will usually be promptly successful. Frequently the task is more difficult. From neglecting specific treatment, or from taking quinine in insufficient doses or at improper times, or from repeated fresh infections, the paroxysms become irregular and the different stages often variable. Besides this, the stomach and intestines are often more or less deranged. In such cases the patients should be put to bed and the temperature taken at short intervals. The bowels should be moved by a mild purgative, and symptoms of irritation of the stomach allayed by appro-

priate treatment. The food must be given in small quantities, the best being milk, with carbonated water or lime-water. Very often a marked improvement follows this preliminary treatment, and as soon as this is evident the specific treatment should be begun, giving the remedy in the way that is least obnoxious to the alimentary canal. Such cases often pass insensibly into the remittent or chronic forms of malaria, unless promptly treated.

To return to the uncomplicated cases. On the day of the expected paroxysm the patient should remain indoors, take easily digestible food in small quantities, and have the temperature taken at intervals. If there is no marked rise, no quinine need be taken until the next period, as described above. If, however, the temperature reaches 100° F. or more, 10–20 grains of quinine should again be taken in the decline, when the attack will almost certainly be broken.

After this the next indication is to restore the patient's strength and promote blood-formation as rapidly as possible. The diet should be generous, and wine may be taken at meal-time. Baths form an important part of the roborant treatment, and exercise is equally valuable. The bowels should be regulated by appropriate treatment. Tonics are always indicated, and among them the cinchona preparations are the best. The compound tincture of cinchona or the similar elixir of calisaya may be given in doses of from 1 to 4 drachms. Very often it is useful to combine a mineral acid with quinine. A preparation which I have used a great deal with satisfactory results is the following:

℞. Quininæ sulphat., gr. xxiv–xlviij;
Acid. hydrochlor. dil., f℥vj–f℥j;
Extract. taraxaci fluid., f℥iij;
Elix. calisayæ, q. s. ad f℥vj.—M.
Sig. A dessert-spoonful after meals in a wine-glassful of water.

Whether taraxacum is an hepatic stimulant or not, it seems to be a useful adjuvant in the treatment of cases in which there is the condition commonly known as torpidity of the liver.

In all cases which have had more than a few paroxysms iron and arsenic must be added to the treatment. Fowler's solution, in increasing doses, and Basham's mixture, are very good forms in which to give these remedies.

This treatment should be kept up until the health of the patient is fully restored, giving quinine at the appropriate intervals to prevent relapses. The condition of the spleen is a useful indication of the complete cure.

The ordinary complications of intermittent fever usually disappear

as rapidly as the primary disease under the influence of quinine. If not, they should be subjected to appropriate treatment as independent diseases.

Remittent and Atypical Malarial Fevers.

The accurate discrimination of this class of fevers is one of the most valuable results of modern clinical investigation. This would have been less important, except for the fact that recognition of their real nature makes possible a rapid return to health, by means of specific treatment, of a large proportion of such cases, instead of leaving them to the *vis medicatrix naturæ* or to the methods followed in other febrile diseases. Formerly the recognition of malarial remittent fever was a matter of individual diagnostic insight, tempered very much by the environment of the physician. Now we have, in the microscopical examination of the blood, one of the most objective methods in diagnosis. If in a given case this cannot be practised, the "therapeutic test" must be tried, during which time the probability of the case not being malarial must not be lost sight of. This is especially important where the existence of typhoid fever is even a remote possibility.

The treatment of simple remittent malarial fever does not differ essentially from that of the intermittent variety. Quinine is to be administered in the first remission, and while waiting for this the most important symptoms may be investigated. If the patient be seen for the first time in what appears to be a remission, no time need be lost in waiting for another one, but a full hypodermic dose of quinine should be given at once. Here, as well as in the milder cases, morphine may be used with happy effects, and may advantageously be combined with atropine.

Vomiting is usually severe, and is often bilious, as indicated by one of the old names for the disease. Constipation is usually present also, and both these symptoms can be treated with advantage by calomel and ipecac in small repeated doses. If vomiting persists after the purgative action is manifest, efforts should be made to restrain it, as previously described. During this time nothing else should be given by the mouth, but food and other remedies given by enema.

Headache, delirium, or convulsions are to be met by the use of morphine, bromides *per enema*, or revulsives.

For hastening the remission, Maclean[1] used aconite, giving one drop of the tincture every ten minutes for an hour, and then every half hour until the temperature began to fall and the skin to act.

As soon as this takes place quinine is to be given. It should never be administered in solid form in such cases. If it is considered certain

[1] *Diseases of Tropical Climates*, London, 1886.

that the stomach is tolerant, it can be given by the mouth, with carbonated water after it. Ten grains should be given at once, followed in an hour by a similar amount, and repeated once or twice if a perceptible impression is not made on the temperature. If, however, the stomach does not retain the remedy, or if it does not seem to be absorbed, no time should be lost, but from 10 to 15 grains should be injected hypodermically, and repeated in one or two hours. In some cases the temperature will fall to a lower point than in the preceding remission, and in a few to the normal. In others little or no impression will be made. The effect of the quinine must be kept up, the patient taking from 20 to 40 grains daily. In very few cases will the fever last beyond the third day, and the fevers lasting more than four days under this treatment are very rare. With the reduction of the fever the cases are practically cured, though they run the same risks and must be treated after the same lines as cases of intermittent fever.

The existence of high temperature by no means contraindicates the exhibition of quinine, though cinchonism increases very much the discomfort of the hot stage if they occur together. The reason for giving quinine in the remission—or, what amounts to the same thing, in the decline—is that experience shows that only when so given does it manifest an evident action on the disease. As the remission is so slight as to escape even experienced observers, the thermometer must always be used to determine the "precious time for treatment," as Maclean calls it.

During the active specific treatment the strength of the patient must be kept up by the use of stimulants and suitable food, best given *per rectum*. In regard to stimulants and analeptics the statements made in connection with intermittent fever hold good. The many and various complications and accidental symptoms of remittent fever are to be treated on general principles. Most of them yield to quinine, so that it is unnecessary to complicate the treatment by giving them special attention during the febrile stage.

Typho-malarial Fever.

This is, in practice, either typhoid fever combined with a malarial infection, or, less properly, remittent malarial fever become adynamic. In the former cases the malarial element is to be treated on the lines already laid down.

Cases have been described in which it was supposed that malarial remittents had assumed a typhoid state. I cannot believe this possible, unless under extraordinary conditions of want of treatment and privation of food. Those investigators who have studied the Plasmodium malariæ in cases of this so called typho-malarial fever—and some of them have had large numbers of severe cases—are unanimous

in asserting they have never seen a case in which quinine failed to produce a good result. (This statement of course does not apply to pernicious cases, which die notwithstanding quinine. In these there is no question of confusion with any continued fever.)

Pernicious Malarial Fever.

Under this heading we can group all the acute cases of malarial infection which appear to threaten life. A large number of names have been given to these types, depending on clinical peculiarities or particular localizations of serious symptoms, but the disease is always the same, and there is but one remedy—quinine.

At times the disease may be suspected by certain peculiarities in the early paroxysms, such as Drake's "coldness in the great toe." Hilarity is not unusual in malarial paroxysms, and is sometimes exaggerated in pernicious cases. But too often the pernicious attack will come without warning.

If, as frequently happens, the physician first sees the patient in a condition of evident danger, cinchonization must be resorted to at once. Here remissions and exacerbations follow in rapid succession, and, no matter when given, quinine is likely to do some good. The vague chance that it may act injuriously as a depressant or otherwise does not come into consideration. It should be given hypodermically or injected into a vein, in the doses already stated.

A full dose of morphine and atropine should be given at the same time, and then the symptomatic treatment be carried out. The important indications next to cinchonization are to keep up the strength of the heart and the general nutrition. Whiskey and brandy hold a prominent place in this treatment, but cannot be relied on alone. They should never be given by the mouth, but, combined with beef-tea, milk, tea or coffee, be injected into the rectum in small quantities at short intervals.

As cardiac stimulants in pernicious malarial fever strychnine, nitroglycerin, and ether are to be used. They must be given hypodermically, in such doses as to make and sustain a distinct impression on the pulse. Strychnine is looked on as a *sine quâ non* in the treatment of the severe malarial fevers by the physicians of the South-West, and I have seen many evidences of its value, alone or combined with nitroglycerin. It should be given in doses of from $\frac{1}{30}$ to $\frac{1}{20}$ of a grain, and may be repeated at intervals of a half hour to two hours if necessary. Many physicians look on strychnine as prone to cause abscesses. I take this to be quite as unlikely as in the case of quinine. The injections are, however, painful, and in one case, where a great many were made, I saw a stubborn œdema remain for some time after recovery.

Baccelli and many Italian and German clinicians recommend injections of ether, to the amount of from 1 to 2½ drachms in twenty-four hours.

In cases with coma, if it has not already been done, calomel should be given, and may be placed on the tongue in one large or several small doses. At the same time stimulating enemata and derivatives to the skin should be used.

In the algid condition a reaction can be most rapidly brought about by rubbing the spine and extremities, or even the whole body, with ice, or, if this cannot be had, by cold douches, followed by friction.

Delirium calls for the administration of morphine hypodermically, bromide and chloral in full doses by enema, cold to the head, and counter-irritation to the extremities. In case there is evidence of congestion, such as injected conjunctivæ and throbbing temporals, blood may be drawn from the temple.

Choleriform symptoms require morphine, with astringents and stimulants. Cold affusions and enemata have been recommended.

Vomiting is to be treated by the methods already described.

Excessive sweating is a symptom of the gravest prognostic import, and, persisting after the treatment already directed, including injections of atropine, usually indicates a fatal termination.

Hiccough, resisting the antispasmodics already mentioned, sometimes ceases under the administration of Hoffman's anodyne in full doses. Coming on late in the disease, it is a very unfavorable symptom.

The dyspnœa sometimes so alarming a symptom in cases of pernicious fever is generally said to be due to congestion of the lungs, and counter-irritants are advised. In some cases, however, it is due simply to the intense and suddenly-developed anæmia. The inhalation of oxygen might be tried in these with benefit.

Hæmorrhage from the mucous membranes or the kidneys indicates the use of ice locally, astringents, ergotin, and the like.

Arrest of the urinary secretion in these cases is usually combined with hæmorrhages and local congestions in the kidney, if we can rely on the conditions found *post-mortem* in fatal cases with this symptom. This complication is rationally treated by hydragogue cathartics, bitartrate of potassium having a peculiarly happy effect, according to some authors.

In pernicious fever the temperature is not always a guide to the progress of the paroxysm, as in the other forms, and the return of a period of safety must be recognized by a cessation of symptoms and the general condition of the patient. Every period of apparent improvement must be seized for keeping up nutrition, and also for making a distinct impression with quinine. As soon as the attack is

checked restorative measures must be carried out, and relapses guarded against by the judicious administration of quinine.

Malarial Hæmaturia.

The treatment of malarial hæmaturia—which term includes hæmoglobinuria—belongs really to the treatment of acute and chronic malarial poisoning. No American physicians at the present time have any doubt about the propriety of giving quinine in these cases, so that a consideration of that once-vexed question is unnecessary. On the other hand, the point may be raised whether the malarial nature of cases of hæmaturia is not sometimes assumed without sufficient reason, and whether some cases are not really due to distoma- or filaria-infection. For the purpose of settling this question proper investigations should be carried out. Within the last few years the subject of "hæmaturia from quinine" has been brought up again by physicians in Greece and Italy.[1] The unusual consequences of quinine in the hands of these men make it almost certain they did not have to do with malarial hæmaturia. If quinine at times seems to increase the blood in the urine, this is a matter neither for wonder nor alarm, since exacerbations of other symptoms also occur at times after the administration of the remedy.

In malarial hæmaturia, after acute malarial infection has been overcome by quinine in antiperiodic doses, the remedy should be kept up as a tonic. At the same time arsenic and iron should be given for the anæmia. It is commonly held that the chloride of iron is the best preparation to use in this condition, though the sulphate is also useful. Many experienced practitioners in the South and West look on strychnine as of little less importance than quinine, not only in the beginning, but also during the after-treatment.

Malarial Anæmia and Malarial Cachexia.

Practically, the line between simple malarial anæmia, the result of a few paroxysms, and the chronic condition, caused by prolonged exposure to the malarial infection, and intensified by mild or severe exacerbations, is of considerable prognostic importance. On the one hand we have a condition which yields readily to treatment; on the other we have an alteration of the physical and mental organization which may last for life.

The treatment of malarial anæmia should begin with the first paroxysm. At that time everything that can be must be done to limit the injury to the minimum, and after the paroxysms are checked the

[1] Pampoukis and Chromatianos, *Prog. Méd.*, No. 27, 1888; Tomasselli, *Gazz. Lombard.*, No. 5, 1889; Lipari, *Il Morgagni*, xxxi. 1889, p. 529.

attention of physician and patient must be directed to the restitution of health.

Some of the measures necessary for this have been described in the treatment of intermittent fever. It is essential that all complications be removed as rapidly as possible, and especially so all those which compromise the efficiency of the organs of digestion. Prominent among these are subacute or chronic inflammations of the stomach, intestines, and liver. These must be treated by the use of unirritating food, local sedatives like nitrate of silver, ammonium chloride, and bismuth, and by avoidance of chilling. Milk diet is often useful, and alkaline mineral waters can be used with great advantage. In the catarrhal jaundice following malarial fever I have had very good results from the use of cold enemata, after the method of Krull, having one or two quarts of water, at about 60° F., injected every morning. In chronic congestions of the liver and gastro-duodenal tract it is useful to give calomel and ipecac, podophyllin, or aloin at intervals to produce a mild effect. Nitric or nitro-muriatic acid may be given in these cases with great advantage.

Iron and arsenic are almost always in order, and may be given in any way the practitioner may prefer to suit individual cases. They can with advantage be combined with strychnine and, if desired, quinine. In many cases small doses of bichloride of mercury produce the happiest results alone, or, better, with iron and arsenic.

A very efficient adjuvant in the treatment of malarial anæmia is change of scene. Very often removal from one part of a town to another seems to cause great improvement, though complete change of climate is still more effective. In malarial cachexia the latter is necessary. No rule can be laid down for the choice of climate. In some cases seashore, in others high and dry mountains, offer the best prospects of improvement. Individual preference or experience usually indicates the proper climate. In making a change of this kind the possibility of a recurrence must be borne in mind. If out of reach of a physician, the patient should be provided with quinine, and on the first sensation of malarial symptoms take a full dose.

Maclean speaks enthusiastically of massage in the treatment of local congestions in malarial cachexia.

Malarial Splenic Enlargement.

In cases of malaria of short duration the persistence of enlargement of the spleen after subsidence of acute symptoms is, probably with justice, ascribed to the existence in it of latent germs. It can therefore be used as a guide to therapeusis, and usually yields to full doses of quinine. In cases of long standing the spleen undergoes a hyperplasia which is never entirely reduced. In recent cases the danger of

rupture of the spleen from even mild traumatism must be borne in mind. Recoveries from this accident show that in cases in which it happens, when promptly recognized, attempts to check the hæmorrhage by means of abdominal section are justifiable.

For pain in the splenic region warm cataplasms or warm baths with cold douches are useful.

For the reduction of chronic enlargement, in addition to quinine and arsenic, ergotin may be injected hypodermically in daily doses of from 3 to 5 drops. Though I have never had an abscess from a hypodermic injection of any kind, and have never seen any bad result from diagnostic aspiration of the spleen, I must confess I would not care to risk an infection of the latter organ by repeated injections, as recommended by Mosler. Other remedies for splenic enlargement, such as potassium iodide and bromide and iodide-of-mercury ointment, are now seldom used.

Masked Intermittents.

Under the name of masked intermittents, or *malaria larvata*, an innumerable host of symptoms or diseases have been described as depending on malarial infection. I do not refer to surgical or obstetrical malaria, under which absurd names some writers, even in recent times, have described certain septic or pyæmic conditions.

The principal reason for the assumption of a malarial origin in these cases is that they are intermittent or periodic. Without wishing to deny that the malarial germ can cause a coryza (Martin[1]), an orchitis (Martin and Charvot[2]) or urethritis (Weber[3]), I do not think satisfactory proof has yet been brought forward as to the malarial nature of the cases in question. Most frequently masked malaria is assumed in neuralgias. In regard to this (and the arguments apply to all the other so-called "masked" cases), it may be said that it frequently occurs in those places where other forms of malaria are almost unknown, and rarely in malarial localities; it does not yield readily to quinine. I have examined the blood of a number of cases of intermittent neuralgia with negative results, and Osler has had a similar experience.

According to Mitchell,[4] "Neuralgias common to all nerve-injuries are apt to reflect a quotidian type, and to occupy the later hours of the day. Non-malarial neuralgias are never tertian or other than quotidian."

The assumption of a malarial origin for an intermittent neuralgia or other disease or symptom should therefore be permitted only after a

[1] *Aerztl. Erfahrungen üb. die Malaria der Tropen-Laender*, Berlin, 1889.
[2] *Rev. de Chir.*, 1888, No. 8.
[3] *N. Y. Med. Rec.*, Sept. 12, 1885.
[4] *Injuries of Nerves*, 1872, p. 195.

thorough examination and exclusion of all other causes. When the malarial theory is accepted, treatment should be carried out on the principles already laid down.

Neuralgia and many other nervous symptoms are common in cases of malarial anæmia or cachexia, without being periodical. They yield to quinine, especially when combined with iron, arsenic, and other tonics.

In neurasthenia of malarial origin phosphoric acid and hypophosphites may be used, with such general and dietetic treatment as is usual in similar cases of different origin.

DENGUE.

THE rational indications in the treatment of dengue are to relieve pain, to mitigate the severity of symptoms, and to support strength and hasten convalescence.

The experience of the last two years shows that the recognition of dengue is no easy matter, and its resemblance to the pandemic influenza of those years points to certain methods worthy of adoption whenever it may again show itself.

Most writers in past years agree as to the benefit of purgatives in the beginning, though these should not be so severe as to increase the pain or lead to undue exposure of the patient. A mild saline or mercurial laxative may be given.

Notwithstanding the apparent insignificance of the disease, the patient should be put to bed in a comfortable room and draughts avoided. For the relief of pain morphine or some other opiate has almost always been relied on, Dover's powder being a favorite preparation. Formerly the pain in the joints and spine was treated by liniments and lotions containing belladonna, camphor, chloroform, and opium. According to Matas,[1] they are useless. Headache may be relieved by mustard foot-baths, cold applications, cold douches, and bromide of potassium in full doses.

Carbolated lotions have been used to lessen the itching from the eruption. For this and all other depressing symptoms morphine, and at times chloral, may be used with great advantage.

In the hot stages the febrifuges formerly in use, such as aconite, acetate of ammonium, and the like, are now obsolete. The cold bath is more effectual. But it is among the newer antipyretics that we must look in future for remedies against dengue.

Salicylates have been used with some success in the South and in the Eastern hemisphere, and, especially in the rheumatic forms, are

[1] Keating's *Cyclopædia of the Diseases of Children*, art. "Dengue."

worthy of further experiment. Salol seems to be the best preparation for this purpose. Of other antipyretics, antipyrine seems to be the only one so far used, and in the hands of DeBruns, with success.[1] But from analogy it seems that antifebrin and phenacetin may be found to be still better.

As soon as the acute stage of the disease is past measures must be taken for restoring strength. The appetite and digestion must be spurred by bitters, such as gentian, calumbo, and cinchona. Strychnine is also very useful, and may be combined with mineral acids. Coca, in the form of wine or as the fluid extract, combined with bitter tinctures, may also be recommended. Exercise and bathing are important adjuvants, and change of scene, especially in a bracing mountain atmosphere, is one of the most effective measures for overcoming the enervation and prostration so marked in convalescents from this disease.

[1] *Semaine. Méd.*, Mar. 6, 1889.

YELLOW FEVER.

By JEROME COCHRAN, M. D.

Introduction.

The literature of yellow fever is immense. In the forty-five octavo pages in which La Roche gives the bibliography of it up to his day, there are nearly one thousand titles; and in the Index Catalogue forty-four quarto pages are devoted to the yellow-fever literature stored away in the great medical library of the Surgeon-General's Office in Washington. I have had little occasion, however, to consult books in the preparation of this article. Personal experience has made me familiar with the methods of treating yellow fever which have found favor with the physicians of the Southern States during the last quarter of a century, and four of these Southern physicians, who have had large practical experience in yellow-fever epidemics, have favored me with special communications giving their individual views in more or less detail—namely, Dr. T. L. Ogier of Charleston, Dr. Thomas Grange Simmons of Charleston, Dr. G. B. Thornton of Memphis, and Dr. John P. Wall of Tampa. Of these communications I have made such use as will subsequently appear.

Looking more broadly over the ground, it occurred to me that it was especially desirable to get some knowledge of the treatment adopted in Havana, the perennial and endemic home of the disease, by physicians accustomed to meet it at all seasons of the year and for many years in succession.[1]

[1] Through the good offices of my friend Dr. Burgess I have been able to obtain communications from fifteen of the leading physicians of Havana, as follows:

Daniel Maynard Burgess, M. D., United States Sanitary Inspector.

Vincente de la Guardia, M. D., and Emilio Martinez, M. D., physicians to the Mercedes Hospital.

Diego Tamayo, M. D., Director of the Bacteriological Laboratory.

Carlos Finlay, M. D., and Claudio Delgado, M. D., who pay much attention to bacteriology.

José Clairac, M. D., physician in chief to the Military Hospital.

Manuel S. Castellanos, M. D., professor of Chemistry in the University of Havana.

José Rafael Bueno, M. D., physician to the Hospital La Benefica.

Enrique M. Porto, M. D., physician to the Out-door Poor.

Anthony Joner, M. D., physician in chief to the Hospital Quinto del Rey, and professor of Pathology in the University of Havana.

Since the first historical epidemics of yellow fever occurred in the West India Islands during the first half of the seventeenth century the treatment of it has undergone many changes. Some of these have been based on the results of the experience of physicians at the bedside, and others have been the legitimate offspring of the several theories of the essential fevers which have at different times obtained currency in the medical world. When acute visceral inflammations were believed to constitute the most characteristic features in the ultimate pathology of all of these fevers, bloodletting, purgation, and mercurialization were invoked for their relief, and at the same time, under the influence of these pathological doctrines, the same remedies were heroically employed in the treatment of yellow fever. When it was the fashion among the physicians of yellow-fever countries to believe that yellow fever was closely allied in its etiology and pathology with the common endemic malarial fevers of those countries, it very naturally became the fashion to treat yellow fever with antimalarial remedies, and especially with an abundance of quinine. Every system of treatment which thus enjoyed a temporary reputation has had its enthusiastic advocates, who have claimed that its superior efficacy has been shown in the speedier recovery of the sick and in the smaller percentage of deaths. No effort can be made here to give the history of these various methods of treatment. This has been done with tolerable fulness up to the year 1854 by La Roche in the thirty-third and subsequent chapters of his learned work. During the thirty-seven years that have passed away since that time, many new departures have been taken in the treatment of the great Southern pestilence; but these also must be passed over, except a few of the very latest of them, without special mention.

Under all of these methods of treatment the mortality of yellow fever has remained very great, and while in some epidemics the proportion of deaths to cases has been greater than in others, there can be no doubt, when all the circumstances have been considered, that these

Antonio Diaz Albertini, M. D., formerly physician to the Garcini Hospital.

Francisco Zayas, M. D., professor of Pathology in the University of Havana.

Besides these original authorities, I desire to make honorable mention of two books to which I have been considerably indebted:

(1) *The Type and Specificity of Yellow Fever.* By J. C. Faget, M. D., New Orleans and Paris, 1873 and 1875.

(2) *The Pathology and Treatment of Yellow Fever.* By H. D. Schmidt, M. D., Chicago, 1881.

The writers of these books, both of New Orleans, were my personal friends. Dr. Faget was the first to establish the type of yellow fever by the discussion of the pulse and temperature rates and the discovery of the want of correlation between them, which is rightly called Faget's law. In Dr. Schmidt's book there are many tiresome digressions, but I regard his pathological researches as the most satisfactory of which I have any knowledge.

variations have been due more to differences in the gravity of the epidemics than to differences of treatment. In the tables of mortality given by La Roche the percentage of deaths to cases in the great majority of the epidemics recorded by him ranges from 40 to 50; and this statement applies equally whether the epidemics were in tropical countries, in European countries, or in the United States. I am aware that epidemics have occurred with a percentage of mortality very much less than 40, and that occasionally the mortality has largely exceeded 50 per cent.; but the rule remains as I have stated it. In the yellow fever in Georgetown, Demerara, from 1851 to 1854, described by Blair, the percentage of mortality was only 13. It was in consequence of this remarkably favorable showing that Blair's calomel-and-quinine treatment was for a time so extensively adopted. But equally favorable results did not follow its use in other epidemics, and now nobody in any country treats yellow fever by Blair's method. In the mean time, the range of the pulse in Blair's cases, as recorded by himself, shows that this Georgetown fever was of a mild type. In contrast with this, the mortality at Barcelona in 1821 was about 70 per cent. of the cases. I wrote the history of the epidemic of 1873 as it occurred in seven Southern cities, and I found the mortality-rate to range from 20 to 25 per cent., but in Mobile it was only 15. In the widespread epidemic of 1878, which I studied in thirty different cities and towns, the mortality everywhere amongst the whites was from 40 to 50 per cent. of the cases. At Brewton, Alabama, in 1883, the cases were nearly all white, and the mortality-rate was 40 per cent. At Decatur, Alabama, in 1888, the mortality-rate among the whites was 30, while among the blacks it was only 8 per cent. In Jacksonville, Florida, in 1888, according to the best information I could get on the spot, the rate of mortality among the whites was about 20 per cent., while among the negroes, although the cases were very numerous, the death-rate was only about 2 per cent. Indeed, the epidemic which prevailed so extensively over the peninsula of Florida in 1887 and 1888 was everywhere of an extremely benignant type. At the same time, the treatment was expectant and symptomatic, and this may have had something to do with the remarkably low mortality-rate.

The Forms and Stages of Yellow Fever.

Yellow fever is always the same disease, but it is convenient to recognize it as presenting itself in three principal forms, which may be designated as follows:

(1) The mild or benignant form; in which it falls below the type and runs a favorable course to a speedy recovery.

(2) The typical or common form; in which it passes through all of

its several recognized stages, exhibiting more or less dangerous complications, and with a considerable percentage of deaths.

(3) The malignant, congestive, or apoplectic form; in which it transcends the type, and results in death in a few hours or a few days.

The several stages of yellow fever, which are completely developed only in the typical form, may be most conveniently fixed at three in number, as follows:

(1) The stage of effervescence; which has also been called the stage of reaction and the stage of primary fever. This stage commonly begins with a chill more or less marked.

(2) The stage of defervescence; which has also been called the stage of exhaustion and the stage of secondary fever. The beginning of this stage is commonly known as the period of calm.

(3) The stage of convalescence.

Yellow fever is a continued fever, a fever of a single febrile paroxysm, but this paroxysm is of very variable duration. It is not a paroxysm of which the length is usually about three days, as has been so generally stated. On the contrary, its usual duration in the typical form of the disease is from seven to ten days. Every table of yellow-fever temperatures that has been published shows this statement to be true beyond all controversy. It is the stage of effervescence only which usually lasts about three days—the stage of febrile commotion. In many mild cases this stage is less than three days; in a few severe cases it may be more than three days. But in the great majority of cases it terminates some time in the course of the fourth day. It is followed by that very notable characteristic of yellow fever, the period of calm, which is the beginning of the stage of defervescence. But the period of calm is not an afebrile period, is not an apyretic period. In it the stage of febrile commotion, the stage of rachalgias and cephalalgias and universal turmoil and discomfort, gives place to a period of delightful exemption from all these troubles. The patient feels as if he was already convalescent. His appetite returns, and it is sometimes not easy to prevent him from perpetrating some alimentary imprudence. He often desires to get out of bed, feeling that further confinement is not necessary to his welfare. As a matter of fact, in favorable cases of the benignant form convalescence does often date from this time, and the fever disappears rapidly, to return no more.

But in the typical form the line of febrile temperature, as shown by the clinical thermometer, simply continues the declension which in the majority of cases was begun a day or two earlier during the stage of febrile effervescence, and several additional days must pass away before the line of normal temperature is reached. If the case is at all severe, the falling temperature does not stop at the normal line, but goes below it a degree or more. In the majority of cases of the typical form—

cases in which the complications are not of special gravity—the stage of defervescence passes into the stage of convalescence and the patients recover. But in a considerable number of cases, before the defervescence is complete, it is interrupted by various complications—by suppression of the secretion of the kidneys, by black vomit, by septicæmia, and by uræmia, and the patients die.

The Havana Treatment of Yellow Fever.

There is considerable diversity of opinion amongst the physicians of Havana in regard to the details of the treatment of yellow fever. Most of them, however, are agreed as to the propriety of eliminative, antiseptic, and antacid medication. Elimination and antisepsis are practised upon the assumption that the yellow-fever microbe has its habitat in the stomach of the patient or in some part of the small intestine, while the antacid medicines are intended to correct the acid diathesis which is so marked in this disease.

It must be remembered that Havana physicians study yellow fever under conditions very different from those that obtain when yellow fever visits this country. With us it is nearly always epidemic, an imported pestilence which spreads rapidly amongst the people, carrying panic upon its wings. But yellow fever is never epidemic in Havana. There it attacks only unacclimated strangers, and has no terrors for the permanent population of the place. In Havana, therefore, yellow fever can be studied with scientific deliberation and thoroughness, while we have to study it in the rush and hurry and excitement of pestilential invasion.

In the discussion of the treatment of yellow fever in Havana, I have thought it best to use the very words of my Havana correspondents, only turning into English the Spanish language used by most of them. In justice to these gentlemen, it must be remembered that they have not attempted in these communications to write systematic treatises on the treatment of yellow fever. They have only given brief and hurried expression to their most important opinions, without any attempt at literary finish; and what they have said is all the fresher for this, and all the more instructive.

Treatment of Yellow Fever by Dr. Burgess.—"During my residence of over twenty years in Havana, much of the time attached to a hospital as visiting physician, besides being engaged in a considerable private practice which was of a character sufficiently foreign to allow yellow fever to develop in it, it has been my fortune to see the rise and fall of quite a number of methods of treating the disease, some of which were based on more or less plausible theories. If a method or remedy happened to be launched when the *genius epidemicus* (so to speak) caused a large proportion of cases of the first or

benignant form (of the three classes into which you have so correctly divided cases of yellow fever), and few of the second form and scarcely any of the third, the reputation of the method or remedy was sufficiently established to allow it to remain in vogue until an epidemic should come along in which large numbers of the second form occurred, some of the third or malignant form, and not many of the benignant form, when the great mortality would destroy faith in the system and the remedy would be abandoned.

"Little or nothing having been known as to the actual cause of yellow fever, I, until about three years ago, in common with many physicians here of good repute for the management of that disease, was in the habit of treating it upon the expectant or symptomatic plan, making use of emetics, purgatives, diuretics, and diaphoretics—an eliminating medication.

"About three years ago it began to be felt that at least a portion of the treatment of yellow fever could have a scientific basis. It was known that the contents of the stomach and intestines, the urine and perspiration, and the whole body, so to speak, were in an intensely acid condition in that disease. It was also believed by many, and suspected by more, that one of the microscopic organisms found in the stomach and intestines was in some way associated with the pathogenesis of the disease. With these views our friend Dr. George M. Sternberg, who was here at the time making researches as to the etiology of the fever, advocated the use of bicarbonate of sodium as an antacid or alkali, and some germicide, preferably bichloride of mercury on account of its well-known powerful germicidal and antiseptic properties and its want of taste and smell. We were very confident that the bicarbonate of sodium would be found of great service, and had strong hopes from the bichloride, but not to the rejection of other germicides. In consequence of this reasoning the following system of treatment was at once adopted by me, with results so satisfactory that during the last three years I have had no desire to change it:

"When I am called to a case suspected to be yellow fever and more or less of the typical form, I at once proceed to empty the stomach and intestinal canal by the administration of an emetic of ipecacuanha when the presence of undigested food is reasonably suspected or if the tongue is coated and foul. As soon as the emetic has had its effect and the attendant nausea has subsided, either by itself or under the soothing influence of a cup of tea or the like—say in three or four hours—some kind of a purge is given, generally oleum ricini, citrate of magnesium, or a saline. About the time the purge begins to act, or even before if its action is at all delayed and has to be helped, I begin with Sternberg's mixture, and give it ice cold, every hour as near as may be, for from four to seven or eight days, usually diminishing the amount about

the fourth day, particularly the amount of the bichloride, and frequently leave this out altogether on the fifth day. All drinks are given ice cold, and, as this mixture is given every hour, no great want is felt for other fluids. No food is allowed until about the fourth or fifth day, when milk or broth may be commenced with, slowly and cautiously and in small quantities at first.

"The alkaline mixture has a strong diuretic action, and under its influence the albumin is apparently better held in solution, and the danger of suppression of urine and uræmia is diminished. As a rule it has also more or less of a laxative effect, occasionally so great as to necessitate its diminution or temporary suspension.

"With the use of this remedy there is apparently less gastralgia, intestinal pains, and gastric discomfort than attend other methods of treatment.

"In considering the treatment of yellow fever under your three stages, I will discuss the question as follows:

(1) "*Treatment of the Chill and Primary Fever—the Period of Effervescence.*—The chill is often absent, and, being generally moderate and of short duration when it occurs, little attention is paid to it. If the patient is plethoric and exhibits symptoms of cerebral congestion, I would approve of the hot mustard foot-bath and hot drinks. In any event, give the preliminary purgative promptly, and after a few hours begin the administration of Sternberg's mixture. No food, no alcoholic stimulants, no hypnotics, and no nervous sedatives. Cold drinks should be given. There is never any collapse in this stage, and, so far as I have seen, heart tonics are not needed. If the headache is severe, apply cold vinegar and water to the head. If the temperature is over 104° Fahr., apply cooling lotions to the surface of the body.

(2) "*Treatment of the Stage of Calm and Defervescence.*—Continue for a few days longer the alkaline and germicidal mixture of Sternberg, and give cool drinks. During the early part of this stage stimulants are rarely needed. A little later milk and broth may be given cold, and when symptoms of debility become manifest stimulants may be carefully administered.

(3) "*Treatment of Convalescence.*—If the heart's action is very slow, the patient should not be allowed to make any exertion whatever. Convalescence is usually rapid, and should be treated as that of other serious diseases, but with greater care in respect to food, which should be of an unirritating character and easily digested, such as milk and broth. Bitter tonics for the appetite, tincture of chloride of iron to improve the condition of the blood, and a little alcohol in some pleasant form, as sherry wine.

(4) "*Special Indication.*—To sustain the failing energy of the heart and prevent collapse, digitalis, nux vomica, alcohol, citrate of caffeine, and hypodermic injections of sulphuric ether may be used. To relieve

the gastric irritation before and after the advent of black vomit, ice, cold drinks, iced champagne, counter-irritants to the epigastric region, and hypodermic injections of ergot are useful. To quiet nervousness and insomnia, bromide of potassium and chloral may be given."

The formula for Sternberg's mixture is as follows:

℞. Hydrarg. chlor. corros., gr. $\frac{1}{3}$;
Sodii bicarbonat., ʒiij;
Aquæ fontis, Oij;
Misce et adde
Alcohol., fʒj.
Sig. Two to three table-spoonfuls, ice cold, every hour.

Rivière's anti-emetic potion is prepared as follows:

Solution No. 1:

℞. Potassii bicarbonat., ʒss;
Syrupi, fʒss;
Aquæ, fʒiij.
M. ft. in solution.

Solution No. 2:

℞. Acid. citric., ʒss;
Syrupi limonis, fʒss;
Aquæ, fʒij.
M. ft. in solution.
Sig. A table-spoonful of Solution No. 1, followed at once by one of Solution No. 2.

The Treatment of Yellow Fever by Drs. La Guarda and Martinez.—"In order that our statements in regard to the treatment of yellow fever may be rightly interpreted, we prefer to give beforehand the facts and theories upon which our treatment is based.

"We believe that there are three forms:

"(1) The mild form, which runs into convalescence after the remission of the fever on the fourth day.

"(2) The common form, which runs into the second stage of fever, and has a duration of eight or ten days.

"(3) The severe form, which has a duration of three or four days, and ends in death by rapid uræmia. We have never seen a case that has died in less than three days, but we suppose deaths occur sometimes earlier in epidemics.

"We recognize only three stages:

"(1) The primary stage, which includes the chill and the primary fever up to the remission of the fourth day.

"(2) The secondary stage, which includes the secondary fever and the complications.

"(3) The stage of convalescence.

"We consider yellow fever to be an infectious disease, which confers subsequent immunity on those who have suffered an attack of it. The agent of infection—so far unknown—is a germ that probably enters the intestinal tract with the water or with contaminated food, or it possibly floats with the dust in the air. This germ multiplies in the intestinal tract, and secretes or forms ptomaïnes which are rapidly absorbed into the blood, producing fatty degeneration of all the viscera, more especially of the liver, the kidneys, and the capillary blood-vessels. Hence the line of treatment we follow is based on two principal indications: (1) to evacuate the intestinal tract; and (2) to assist the viscera to eliminate the ptomaïnes that were absorbed into the blood. These notions of the disease have been greatly influenced by the investigations of Dr. George M. Sternberg, and his treatment will fully satisfy us until the unknown germ is found and some specific treatment is devised to take its place.

"Suppose we had to treat a case of the common form, we would proceed as follows: We see the patient a few hours after the chill, and we at once administer an emetic of ipecacuanha. After free vomiting we give the patient three hours' rest, and then prescribe calomel and jalap, of each 1 gramme—15 grains—divided into two powders, and taken with one hour's interval between them. After the first stools we commence with Sternberg's mixture, giving a small glassful, 145 grammes, ice cold, every hour day and night. Sometimes we omit the bichloride of mercury in this mixture. After the fourth day we begin to diminish the bicarbonate of sodium, and we suspend it wholly after the eighth day. We give then a stimulant, such as the cognac mixture, which is made as follows:

℞. Ext. cocæ fluid.,	fʒss;
Cognac,	fʒij;
Infusion. caffæ,	fʒiij.—M.

Sig. A table-spoonful every two hours.

"The *rationale* of this treatment is as follows: With the emetic and purgative of the first day we get rid of much of the offensive material from the alimentary canal. The alkaline mixture has the double purpose of neutralizing the acid media of the stomach and bowels, and is at the same time an excellent diuretic, which helps to eliminate the ptomaïnes and to keep the kidneys in function. We give plenty of ice-water and bits of ice. As to diet, on the first two or three days we give nothing at all; after that small quantities of iced milk or broth.

"We do not pay any attention to the fever as a mere symptom at any stage of the disease, as it is never so high or so prolonged as to endanger life; and it is far better to attend to the cause of the fever and to free the intestines from the poisonous germs and ptomaïnes. We give no hypnotics. On the contrary, we awaken the patient every hour during the main part of the treatment to give him his medicine. We seldom have occasion to give purgatives after the first day, as the large doses of bicarbonate of sodium move the bowels somewhat. If we should not have at least one stool every day, we give enemata. On the other hand, in cases in which the large doses of the bicarbonate produce diarrhœa, we diminish the amount, because the occurrence of the diarrhœa shows that it is not absorbed; we fail, therefore, to get its diuretic action, and there is danger of uræmia. We do not consider diaphoresis to be desirable, as it diminishes the renal function, which is more important. In debility of the heart and collapse we give a mixture of coca, cognac, and coffee. Uræmia is the principal cause of death in yellow fever. The bicarbonate of sodium sustains the action of the kidneys. Acetate of potassium is sometimes given. Quinine has been extensively used in yellow fever, but has proved of no benefit, and is now abandoned. It increases gastric irritation and embarrasses the function of the kidneys. We regard opiates as dangerous, because they reduce the volume of urine eliminated and induce constipation, thereby diminishing the excretion of offensive material from the bowels. The fluid extract of ergot is used hypodermically to check profuse hæmorrhages. Beta-naphthol has been used by a physician of this city as an intestinal antiseptic, but with no better result than that which follows the common symptomatic treatment."

Treatment of Yellow Fever by Dr. Tamayo.—"In a work that I presented to the First Medical Congress of the Island of Cuba, which was held in the month of January, 1890, I gave a summary of my manner of interpreting the pathogenesis of yellow fever in the following words: 'Yellow fever is an infectious disease of which the infecting germ finds its field of cultivation in the stomach, where the germ finds a place for the production of ptomaïnes or of diastases, which not only induce alterations in the mucosa by local action, but which, passing into the intestines, are absorbed, thereby engendering the general phenomena of the toxic infection.'

"From this fundamental conception of yellow fever is derived the treatment I habitually practise. In its benignant form yellow fever is reduced to a gastro-intestinal catarrh, which can be relieved by any rational treatment.

"In the majority of cases my treatment is as follows: Emulsion of castor oil made aromatic with essence of peppermint, one ounce of the oil to be taken every three hours (or oftener if deemed

necessary), and with it 50 centigrammes (equal to $7\frac{1}{2}$ grains) of calomel. In the intervals give pastilles of salol with bicarbonate of sodium and citric acid. When these are placed in contact with a liquid the citric acid reacts upon the bicarbonate with liberation of the carbonic acid, scattering the salol, a useful soluble antiseptic, which by virtue of this property reaches the intestines mixed with the materials dragged along by the evacuants. Give cold water freely, encouraging the patient to drink the largest quantity possible. Apply constantly to the epigastrium a cold compress covered by an impermeable cloth, which determines congestion of the skin and augments the local temperature, and, besides, stimulates the functions, digestive and motor, of the stomach. If on the application of the compress the sensation of cold persists without the occurrence of the hydrotherapeutic reaction, then arrange around the compress a thick rubber tube filled with water at 38° to 40° C. (equal to 100° to 104° Fahr.), and the reaction appears rapidly. This is the most efficacious means for the prevention of vomiting and gastralgia.

"This is my treatment during the first stage of the fever, the stage of effervescence, and I propose with it—1st, to scour with the evacuants the intestinal tube; 2d, to modify the gastric medium by the presence of the calomel, the salol, and the mint; and, 3d, to augment the vascular tension by the ingestion of large quantities of water, making active in this way the emunctories of elimination, to which also the diuretic action of the calomel contributes.

"At the beginning of the remission, or stage of defervescence, I sustain the intestinal elimination with repeated doses of sulphate of sodium, and persist in the use of the salol, watching the urine, and besides give coffee and benzoate of sodium. I continue the cold applications to the epigastrium, and administer large enemas of cold water with sulphate of sodium. I propose to keep the gastro-intestinal canal always clean, and to keep open this potent channel of elimination; to modify as much as possible, and permanently, the medium in which the infectious germs live; and to secure intestinal asepsis if possible. The benzoate of sodium makes soluble the extractive products existing in the organism, on account of both augmented production and retention, the benzoic acid reacting on the uric acid and eliminating it in the form of hippuric acid, which is perfectly soluble. The coffee I regard as an indirect aliment, a disinfectant, and a cardio-vascular tonic.

"I continue with this treatment up to the beginning of the convalescence, in which I maintain the intestinal elimination by the sulphate of sodium, and administer quinine in combination with wines like sherry. The alimentation during the whole sickness is invariably milk, which is used always very cold and with a free hand.

"*En résumé:* Yellow fever is an infectious gastritis, and the treat-

ment has for its object to combat this gastritis; to modify the medium in which the infectious germs live and develop; to impede as much as possible the multiplication of the germs; to eliminate by the great intestinal conduit the microbial products and the organic *débris* which is deposited as an alluvium in the irritated tissues; to sustain with prudence the renal elimination; and to give power to the organism to resist both the original toxic infection and the secondary autogenous infection.

"With this treatment excellent results have been obtained during the last three years, in which yellow fever has been variously modified.

"The wet compress on the epigastrium is applied according to the method of Professor Winternitz of Vienna. The folded compress is squeezed out of cold water and spread over the epigastrium, and is then covered with some impermeable tissue, as oil silk or rubber cloth. The first sensation is, of course, of cold, but presently the humid compress acts like an irritant to the skin, provoking active fluxion in the cutaneous vessels, and so finally brings about the local augmentation of temperature."

The salol tablets are composed as follows:

℞. Salol,	gr. iij;
Sodii bicarbonat.,	gr. iij;
Acid. citric.,	gr. iss.—M.
Ft. in tabel. No. 1.	

The three ingredients must be very dry before they are mixed together. The largest amount of salol given by the author is 9 grammes (138 grains) in the twenty-four hours. This would be equivalent to one hundred and thirty-five tablets.

Treatment of Yellow Fever by Drs. Finlay and Delgado.—"In order to explain the principles on which our treatment is founded it seems necessary to describe the three clinical forms under which we classify all yellow-fever cases. These forms are—

(1) "The non-albuminuric form, which is characterized by the absence of albuminuria during the whole course of the disease, or if it appears at all it is of insignificant quantity and ephemeral duration. These cases all recover.

(2) "The simple albuminuric form, which is characterized, on the one hand, by the presence of albumin in the urine after two or three days of fever, and on the other hand by the absence of gastric complication during the advanced stage. The great majority of these cases recover.

(3) "The gastric and albuminuric form, also called by us the melano-albuminuric form, which is characterized not only by the presence of albumin in the urine, but also by the occurrence of gastric complica-

tions when the disease is at its height or apparently on its decline, such as black vomit, or the ejection of similar material through the bowels, or indications that such products are retained in the stomach or intestines. Almost all the fatal cases belong to this form, which we attribute to a secondary infection originating in the gastro-intestinal tract. Our principal efforts in the treatment are directed, therefore, toward warding off this dreaded localization of the morbid process in the digestive organs, by clearing these organs of all offensive matters, and by affording them functional rest during the evolution of the disease.

"Our plan of treatment is as follows: As soon as possible after the invasion a purgative is administered, preferably of castor oil beaten up with lemon-juice, to be repeated the same day if necessary to secure the complete evacuation of the bowels. Should the intolerance of the stomach be too great to allow the retention of the oil, fractional doses of seidlitz powder in iced water will sometimes enable the oil to be subsequently retained. Enemas may be used to hasten the purgative action. After the bowels have been thoroughly cleaned out no other purgatives are given, but the enemas, of emollient decoctions or of weak solutions of boric acid, are continued every twelve hours. As soon as convenient after the purgative dose 4 grains of beta-naphthol are administered, and repeated every six hours. Each dose of naphthol is followed by 8 grains of bicarbonate of sodium, and two hours after each dose of the bicarbonate a table-spoonful of a 2 per cent. solution of hyposulphite of sodium is administered. The three medicines are continued in the same order during the first four or five days.

"As a drink we give boiled water, cool or iced, and flavored if desired with lemon, orange, or pineapple juice. No food of any kind, solid or liquid, is allowed before the fourth or fifth day, not even in mild cases. Small enemas containing from 8 to 16 grains of chloral constitute an appropriate hypnotic. Valerian and the bromides are often prescribed as nervous sedatives.

"Hypodermic injections of ergot sometimes do wonders in severe hæmorrhagic cases with copious black vomit, but they appear to do harm when dyspnœa has set in. Blisters to the pit of the stomach and bits of ice kept in the mouth allay the gastric irritation of the advanced stage. Mercurials, quinine, and opium or morphine we consider more injurious than beneficial as a rule, but we have occasionally prescribed a dose of calomel at the beginning as the only purgative that could be retained. Antipyrine we employ only when required to keep the fever below 40° C. (104° Fahr.) in the first stage. Hot foot-baths, cold applications to the head, chloroform liniment to the loins and limbs, are sometimes useful on the first and second days; sometimes leeches behind the ears may be required.

The Treatment of Yellow Fever by Dr. Clairac.—(1) "I advise the foot-bath in cases of violent chill or of violent cerebral congestion, and also encourage the use of warm drinks with the object of promoting active diaphoresis. I prefer emetics to purgatives at the beginning of the treatment if the condition of the digestive tract of the patient needs them. I prefer the saline purgatives. The fever subsequent to the chill I treat generally with sudorifics and vapor baths, sustaining the laxative effect for the first and second days, and disinfecting the gastro-intestinal tube with beta-naphthol, salol, and salicylate of bismuth. By no means in this first stage use ice, lotions, frictions, febrifuges, sedatives to the nervous system, hypnotics, diuretics, cardiac tonics, or alcoholic liquors. I have never seen collapse in this stage of the disease. Absolutely no food must be given.

(2) "During the remission, when it exists—which is in very few cases—continue the treatment begun in the previous stage. Give no food. Do not give stimulants. Continue the antisepsis of the intestinal tube. I have never obtained any advantage from the employment of quinine or any other febrifuge. If the fever persists or presents itself anew after the remission, I employ alcoholic tonics; cold lotions of aromatic vinegar or aromatic gin and cold water, equal parts; cold acidulated drinks; and clysters of cold water slightly acidulated; under no circumstances do I give purgatives. General treatment is proper for the other pathological phenomena that may present themselves.

(3) "The period of convalescence necessitates care analogous to that given to patients recovering from other grave diseases; but recovery from yellow fever is usually rapid.

"To sustain the energy of the heart the best medicine, in my judgment, is citrate of caffeine. For gastric irritation cold seltzer-water, cold champagne, champagne frappé, a triangular blister to the epigastrium, the anti-emetic draught of Rivière, alone or with the addition of hydrochlorate of morphine; and if passive hæmorrhages and black vomit are frequent and abundant, 100 drops of fluid extract of ergot in one table-spoonful of cold water. For nervousness and insomnia give bromide of potassium, morphine, and extract of opium. The effect of quinine is negative if not prejudicial. Under the use of antifebrin and antipyrine the temperature does not always descend, and in grave cases in which there is a fall in temperature it lasts but a short time, to mount again rapidly.

"The question of restoring the functions of the kidneys when albuminuria and growing scantiness of urine threaten danger is one which I consider the most important of all and the most difficult to answer. The renal functions are of great importance in

the physiological pathology of yellow fever. The result most grave is the uræmia, and the suppression of the function of the kidneys comes as a consequence of this, usually in a short time. Against this condition our therapy is almost impotent. The most active diuretics have little effect in such cases.

"The presence of albumin in the urine is a phenomenon constant and pathognomonic of yellow fever, and the post-mortem lesions of the kidneys are extensive and grave."

Treatment of Yellow Fever by Dr. Castellanos.—"I feel authorized by a practice of more than twenty years as physician to the Tacon Theatre, where I frequently attend cases among individuals of foreign theatrical companies, to state that there exists no specific treatment for yellow fever; that the plans of treatment followed successfully by some practitioners fail when employed by others; and that the results of treatment frequently depend on the meteorological conditions prevailing at the time of the attack.

(1) "*The Stage of Effervescence.*—I begin at once with the administration of a purgative, giving preference to the salines, and amongst these to the citrate of magnesium. One of the objects of the purgative is a derivation of the congestion from the brain to the intestines. After the advent of the fever the principal medication employed is the bicarbonate of sodium in large doses—from 2 to 4 grammes (30 to 60 grains)—in the twenty-four hours, with the view of trying to render the blood alkaline; and in connection with this a symptomatic medication depending on the form assumed by the fever, on the constitution of the patient, and even by his course of life anterior to the attack, the use of drastic purgatives being very frequent. I have never used ice to the head or cold lotions, fearing that their subsequent effect would be to favor the cerebral congestion. I have often used diuretics, preferring the citrate of potassium—40 grains in the twenty-four hours—without employing heart-tonics. At other times I have used febrifuges when there was a predominant malarial tendency, but never alcohol, unless in the form of the weaker wines when the predominant tendency of the disease is adynamic. Absolutely no food is to be given throughout this stage.

(2) "*The Stage of Defervescence.*—The management of the patient during this stage must also be regulated according to the form of the disease. If congestive symptoms predominate, alimentation must be very scanty—hardly 4 or 6 ounces of milk in the twenty-four hours; but if, on the contrary, the predominant symptoms are adynamic, the patient may be given even much more milk and some 10 ounces of broth. Cold acid drinks, with a preference for sulphuric-acid lemonade, may be taken abundantly. Stimulants are hardly ever indicated, of whatever class they may be.

"If the urine shows the presence of albumin, antiseptics should be used, such as beta-naphthol, phenate of sodium, or resorcin, and these may be combined with the sulphate of quinine. Or Sternberg's mixture may be used, which has, I believe, given me the best results. For the black vomit iced drinks must be used and the perchloride of iron administered. When syncope exists or obstinate singultus is present, these symptoms may yield to the use of hypodermic injections of sulphuric ether, and to blisters on the hypogastrium.

(3) "*The Stage of Convalescence.*—If the form has been benign or of moderate intensity, the patient may be allowed broth, milk, and wine; but if the form has been grave, it is necessary to be very careful with the alimentation, as there is danger of indigestion producing a relapse which is almost always fatal.

"Usually, when the urine becomes scanty and with abundant albumin, the chances are that complete suppression will supervene with the train of phenomena attendant on uræmia, and with a fatal termination of the case. Under such circumstances, although without much hope of benefit, we give diuretics and antiseptics in large doses.

"Of all the medicines used as hypnotics, the best in yellow fever, according to my judgment, is sulphonal, as it not only quiets the nervous excitement and induces sleep, but it leaves no stupefying effects like narcotics. As to oil of turpentine, creasote, ergot, digitalis, and chloral, I do not think that any of them have any importance in the course of this disease. I have not used opium or morphine."

The Treatment of Yellow Fever by Dr. Bueno.—"In the course of fourteen years of practice as physician to the Hospital La Benefica I have had occasion to test the value of most of the methods recommended for the treatment of yellow fever—methods which, according to their authors, had produced wonderful successes. These methods in my hands have not accomplished the announced results. Far from that, my statistics have been very different from those so often obtained by others, and my rate of mortality has been largely determined by the epidemic constitution of the several seasons. The intestinal antiseptic method with beta-naphthol gave a colleague last year only 15 per cent. of mortality, as he announced in the papers, but it gave the year before 30 per cent. of mortality at La Benefica. The method of Dr. Sternberg, in a clinic at the Mercedes Hospital, gave 15 per cent. of mortality, and at the Hospital Garcini the same method gave a mortality of 38 per cent., while at the same time symptomatic treatment and expectancy gave 15 per cent. of mortality. To what are these differences due? To two causes: The first, signalized by Dr. Weiss in the Cuban Medical Congress, is the epidemic constitution of the various seasons or the genius of the epidemic itself, which gives good and bad results, and always in series.

The second is the self-conceit and vanity of the authors of the treatments.

"In my clinic at La Benefica I rely on the purely expectant method, and when I am forced to do so I fight against symptoms, so that my treatment is that of an armed expectancy. In the benign form of yellow fever I do nothing except to give an emetic and a saline purgative. The very grave or siderant form does not give you the opportunity to do anything that helps the patient. The common or typical form is the field of operation of all the founders of treatments. It is here that the influence of medication can be better appreciated and the results of treatment better judged.

"In this form I always administer an emetic at the beginning of the attack, and follow this by a saline purgative on the second day. Besides this, I give alkaline drinks, employ frictions to quiet the lumbar pains, and administer antipyrine for the relief of the headache. I may add here that I have not seen the antipyrine cause diminution in the quantity of the urine during the first stage of the fever. In the mean time, it brings great relief to the patient. To prevent too great elevation of the temperature I use cold drinks and affusions of aromatic vinegar.

"During the period of calm I continue the alkaline drink, and if the emetic and cathartic of the first and second days have not produced abundant intestinal evacuations, give enemas of saline purgatives. In this period I begin the administration of food, preferably cold or frozen milk, which, besides its nutritive value, acts as a diuretic. I sometimes combine it with cognac or rum, or some other alcoholic liquor preferred by the patient, even when the heart does not show signs of debility. Throughout the period of defervescence the same plan is observed.

"For black vomit, blisters are applied to the epigastric region, and ice and champagne frappé are given internally. For the prevention of collapse, hypodermic injections of sulphuric ether and caffeine are useful. Insomnia and nervousness may sometimes be relieved by tepid baths. To restore the suspended function of the kidneys is always difficult if not impossible."

The Treatment of Yellow Fever by Dr. Porto.—(1) "*The Stage of Effervescence.*—Very few cases exhibit the initial chill in any decided way, and these are usually of the paludal type. I generally begin the treatment with a hot mustard foot-bath and a sudorific potion of acetate of ammonium, cognac, and tea. If there are coated tongue and nausea, I give an emetic of ipecacuanha, and the next day a purgative of citrate of magnesium or of sulphate of sodium. If the tongue is not coated, I give simply a saline purgative at the beginning. As soon as the fever is established the patient is

generally put on small doses of aconite in some cold acid drink—lemon or pineapple juice. If there is hyperpyrexia, lotions of aromatic vinegar to reduce the temperature, and cold compresses of the same to the forehead to alleviate the headache.

(2) "*The Stage of Defervescence.*—Give during the period of calm ice-water and milk; afterward a tonic mixture of extract of cinchona and cognac, alcoholic drinks, and milk, and if there is great elevation of temperature use cold affusions of aromatic vinegar.

"Gastric irritation and black vomit are treated with the anti-emetic potion of Rivière, and cold champagne and external revulsives. For the hæmorrhages I use fluid extract of ergot and perchloride of iron, and as a diuretic nitrate or acetate of potassium. For nervousness and insomnia combinations of bromide of potassium and opium are very useful.

"Ignorant of the pathogenic elements of this disease, typical in all its grades, the symptomatic medication is that which I prefer, limiting myself to the following principles: (1) To eliminate excrementitious matters by emetics and purgatives, and to keep free the digestive tube; (2) to sustain the natural powers of the patient; (3) to control the great elevations of temperature; (4) to combat the complications; (5) to maintain urinary elimination."

Treatment of Yellow Fever by Dr. Joner.—(1) "*Stage of Effervescence.*—During the chill, when there is a strong congestive headache, I approve of the hot foot-bath. I never give hot drinks, because they increase the temperature. I always use a purgative at the beginning—sometimes sulphate of sodium, 1½ ounces; occasionally castor oil, ½ ounce. In plethoric subjects, who have a thickly-coated tongue and complain of severe cephalalgia, I always give an emetic—40 grains of ipecacuanha—before the purgative. After the rise of the fever I allow cold drinks, and apply a mixture of vinegar and water to the forehead when there is violent headache. I also use the same mixture as a general lotion to lower the temperature when this rises above 104° Fahr. I never use hypnotics or sedatives internally. I take great pains to secure intestinal asepsis, using for this purpose salol in 5- to 10-grain doses every three hours; or at the same intervals 10- to 15-grain doses of beta-naphthol. Salicylic acid has not proved to be successful.

(2) "*The Stage of Defervescence.*—During the calm at the beginning of this stage the rule I follow is rest and expectation, with symptomatic medication. As the case progresses, milk diet may be allowed, and the bowels should be kept well open. If black vomit occurs, all food is suspended, and ice, cold seltzer-water, iced champagne, and Rivière's potion are used. A blister to the epigastrium or an ice-bag on the same region is a favorite remedy. As diuretics I use milk-

sugar, 4 ounces at a dose in a pint of hot water, pleasantly flavored. The acetate of sodium, 2 drachms; infusion of digitalis, 20 grains to 4 ounces of boiling water; carbolic acid, 10 drops at a dose in an ounce of glycerin; alcoholic stimulants in moderate quantities; and sinapisms or thermo-cautery applications to the lumbar region may all be useful.

"During convalescence great care is to be used in regard to food. Albuminuria is not in itself a contraindication to the use of animal food, but if it is accompanied by renal casts, then a strict milk diet must be maintained. The best remedies to sustain the failing energy of the heart are digitalis, alcohol, and hypodermic injections of caffeine or ether. Quinine I believe to be entirely worthless in yellow fever. Opiates I strongly oppose. Ergot hypodermically is a good hæmostatic—half a drachm of the fluid extract at a time."

The Treatment of Yellow Fever by Dr. Albertini.—"Yellow fever being an infectious disease, of which the pathogenic element is unknown to us, the natural result is that here, as everywhere, the medication has been, and still is, symptomatic, empirical, and routine. In this respect, after thirty-four years of practice, I have done nothing but apply the principles of general therapeutics to the special cases that have come within the range of my observation, without venturing to give the preference to any special method. From the purely clinical standpoint I am convinced that in yellow fever, as in the other infectious diseases, the success of the methods employed is subordinate to the degree of infection and to the constitutional power of resistance of the patient. But this does not prevent me from affirming that, of all the methods used in the treatment of this disease, the one that has left the best impression on my mind is that which by the exhibition of emetics, purgatives, diuretics, and diaphoretics constitutes an eliminatory medication."

Treatment of Yellow Fever by Dr. Zayas.—"As for the treatment of yellow fever, all the methods used here—and they have been most varied and sometimes most absurd—have given almost the same results, including also the expectant method; that is to say, none of them have perceptibly diminished the usual rate of mortality, which, besides, is very variable in different years, with no known explanation of the causes of such differences.

"Recently three agents have been used here experimentally in the treatment of this fever:

(1) "Internal washing of the organism. This is described by Dr. Sahli in *La Semaine médicale* of Paris. Although he does not speak of it in its application to yellow fever, yet he states that it has a powerful influence in augmenting the quantity of urine in cases of uræmia, which is one of the gravest complications of yellow

fever and one of the most serious prognostic symptoms. (2) Cocaine, given a few minutes before taking food, in doses of 2 centigrammes —$\frac{1}{3}$ of a grain—to prevent vomiting and epigastric distress. (3) Oil of turpentine, in capsules, in the icterus with ischuria and grave symptoms of uræmia. We can affirm nothing as yet as to the efficacy of these new agents."[1]

The American Treatment of Yellow Fever.

Hygienic Management.—The hygienic management of yellow fever is the same for all the forms of the disease, with the proviso that in the severer forms greater care must be taken to carry out thoroughly all the rational indications. The yellow-fever patient should be placed in a cool, airy, and well-ventilated apartment, without carpets or mats. His bed should be furnished with a good, pleasant, springy mattress, without feathers, and the covering should be just enough for comfort. Heavy blankets and all excess of covering are mischievous. It is necessary to emphasize this caution, because people generally are under the impression that yellow-fever patients should be so warmly covered as to keep up a profuse perspiration ; and the physician will have to be very positive to induce them to comply with his wishes in this respect. All that is desirable in this direction is that the skin should be kept soft and very slightly moist. Profuse perspiration is always to be avoided. Perspiration in yellow fever is never critical, and exerts but little influence in lowering the temperature. If the patient is restless and uncomfortable and insists on kicking off the cover, it is better that he should be allowed to have his own perverse way than to keep him annoyed by continually pulling the cover over for fear he may take cold. Such restlessness is an unfavorable symptom, but it does not make the chances of the patient any better to keep him covered against his will.

Some of the windows of the apartment should be kept open day and night, so as to have plenty of fresh air, unless the weather is damp and chilly, in which event a blazing wood-fire promotes ventilation and helps to make the apartment bright and cheerful. Draughts through the apartment are not amiss, but if stronger than a very gentle breeze they should not be allowed to fall directly on the body of the patient.

[1] The internal washing of the organism advocated by Dr. Sahli has substantially the same result as the hypodermoclysis of Dr. Cantani. The description of the method and apparatus employed is too long to be given here in detail. The intention is to secure the introduction of very large amounts of water into the cellular tissue under the skin, especially of the abdomen, by means of a canula connected with a rubber tube, which is connected with an elevated flask filled with the warm water which is to be so injected. It is stated that in this way as much as a quart of water can be introduced safely two or three times in the twenty-four hours.

It is taught by some authorities that the bed and clothing of the patient should never be changed from the beginning of the sickness until the convalescence is fully established. On the contrary, I hold that everything about him should be changed just as often as it gets soiled. Let him have the luxury of clean shirts and clean sheets. These changes can be made so as not materially to expose or fatigue the patient.

As a rule, the patient ought not to be allowed to get out of bed or to exert himself any way. This rule is not so important in the stage of effervescence as it is in the stage of defervescence; but it is better to be over-cautious than not cautious enough. Bed-pans should be used to receive the excretions from the bowels and kidneys, and even the drink and food should be administered in the recumbent or half-recumbent position. This is a wise rule in all severe cases, but during the dangerous days of defervescence it should be imperatively enforced; and if the patient needs to be moved in the bed, he should be lifted and turned like a child. So great is the debility of the heart in some cases that getting out of bed or sitting up in bed brings on fatal syncope.

It has been said of yellow fever that it is a disease that requires very little medication and a great deal of nursing; and certainly good nursing, day and night, without any intermission of careful attention, is of the utmost importance. Regularly educated nurses, when they can be had, are above all price. Usually, however, the nursing can be done by members of the family, whose solicitude will guarantee their faithfulness, or by intelligent friends who can be trusted to carry out the orders of the doctor. A great deal has been said about the importance of having nurses that understand the disease; but all that the nurse needs to understand is how to obey the instructions given him. The average volunteer nurses of our Southern cities, who swarm numerously whenever we have an epidemic of yellow fever, are unmitigated nuisances, and always to be avoided. A few of them make good nurses, but as a rule they are useless. In our Southern cities it is usually possible to get a sufficient number of colored women to do the nursing, and with a little instruction they frequently do very well. It is greatly in their favor that they are not likely to contract the fever.

It is always desirable in the very highest degree that the apartments in which the sick are treated should be situated in some part of the city or its suburbs that is free from the yellow-fever infection. This can frequently be arranged without any difficulty; and it makes a great deal of difference whether the patient during his sickness has to breathe the infected air of an infected house, or whether he breathes air that is free from infection. In great epidemics, when hospitals have to be provided

for many of the sick, they should always be placed outside of the areas known to be infected, and if a hospital already in use becomes infected it should be promptly abandoned. Better treat the sick in tents in a pure atmosphere than in infected buildings. To many it will seem strange to talk of yellow-fever hospitals remaining free from infection. But such examples are not uncommon. Take two recent examples: In the great Florida epidemic of 1888 a large number of patients were treated at the Sand Hills Hospital, a few miles out of Jacksonville. The mortality was extremely small, and out of about twenty unacclimated attendants not a single one took the fever. During the same year thirty-five cases were treated at the Camp Perry Hospital, with only three deaths, and of five unacclimated attendants not one took the fever. The yellow-fever poison is a grovelling poison, of the earth earthy. It will not fly over a wall twenty feet high. It therefore follows that if the sick have to be treated in infected localities, it is better to put them in the upper stories of the houses than in the lower ones.

That the excretions of yellow-fever patients are contaminated with the yellow-fever poison has not been demonstrated, but it is strongly suspected. It is a dictate of prudence, therefore, that these excretions, whether from the stomach, the bowels, or the kidneys, should be subjected to the action of disinfectants. For this purpose the most approved agents are chloride of lime and carbolic acid. The chloride-of-lime solution is made by dissolving 6 ounces of the chloride in 1 gallon of water. The carbolic acid should be used in a 5 per cent. solution. These solutions should be employed very freely. From a pint to a quart should be mixed with each evacuation, and left in the vessel one hour for the chloride-of-lime solution, and four hours for the carbolic-acid solution, before throwing into the privy vault or water-closet. Quicklime should be freely used in privy sinks and upon all damp places in the yards.

The Use of Water.—Water is, in my judgment, the best of all febrifuges in yellow fever. It may be used both internally and externally, and its temperature may be varied to suit the prevailing indications. For internal use Dr. Simmons prefers to have the water ice cold, Dr. Ogier and Dr. Wall prefer warm drinks, and Dr. Thornton prefers the drinks to be either warm or only moderately cool. During the stage of effervescence I myself am in favor of a very liberal allowance of water in some palatable form, either pure water or some of the alkaline mineral waters, like seltzer or apollinaris, or some of the milder Saratoga waters, of which usually the mildly aperient properties are not objectionable. Bearing in mind the acid diathesis of the disease, acid drinks do not seem to be theoretically indicated; but if the patient expresses a preference for

acid drinks, they should be unhesitatingly allowed. As to the temperature of the drinking water, I prefer it to be just pleasantly cool, without being as cold as ice. I have known ice-cold water and crushed ice to be given in small amounts so frequently as to create an insatiable thirst, just as all of us have known children to provoke a similar condition of irrepressible thirst by eating snow. In the mean time, the higher the temperature of the patient the lower may be the temperature of the water allowed. If at any time the patient prefers to drink warm teas, his preference should be gratified, but not many such patients will be found.

As to the quantity of water that may be consumed with advantage, it is not possible to lay down any definite rule. I usually allow the patient about as much as he wants, taking care, however, that he shall take only a moderate amount at a single draught. Follow Nature. She is wiser through her instincts of craving and repulsion than the doctor is through the teachings of his science. If the patient craves a great deal of water, that craving is the surest of all indications that he needs a great deal. Water thus liberally used certainly exerts a considerable febrifuge influence. It promotes diuresis and diaphoresis. It cools the alimentary canal as far as it reaches it, and cools the hot blood into which it is absorbed. It soothes the perturbed nervous system and helps to keep the patient quiet. Shall we not also venture to hope that it has some power to wash out of the blood the terrible ptomaïne that causes so much trouble?

If the febrile reaction is very high, and if other methods of reducing the temperature have failed to accomplish that result, enemas of cold water frequently prove beneficial. They should be large—from one to three pints, and sometimes even more—should be introduced slowly and retained as long as possible, the retention giving time for the cooling process to go on, and also for the absorption of some part of the water. The temperature of the water used may be regulated by the pathological temperature to be combated—the hotter the patient the colder the water; but I think it should never be as cold as ice. These enemas, if they give relief to the patient, may be repeated as often as seems necessary. If they are not agreeable to the patient, they should be promptly abandoned.

By the common consent of yellow-fever experts water and watery fluids may be applied to the surface of the body in yellow fever, in the form of ablutions, affusions, and spongings, with very evident advantage. The face and hands may be washed as often as the patient finds it agreeable. The chest, and even the whole body, may be occasionally sponged over with either tepid or cold water, or compresses kept wet with cold water may be applied to the head or to the abdomen. Here, again, the rule applies that the temperature of the water may be

reduced just as the temperature of the patient is augmented. If the patient is very hot, it is not easy to hurt him with cold water.

In cases in which the temperature is extremely high and the neuralgias extremely painful the wet-sheet pack might be advantageously used. But yellow-fever patients require to be handled with great care, and the application of the wet pack is attended with some trouble; and I think the cases are not many in which it would be worth while to discuss the propriety of its use.

It is necessary to say a few words about the uses of ice in yellow fever. During the stage now under consideration I think the use of ice is hardly ever desirable, except to give to the water for external or internal application the proper temperature. But it may sometimes be demanded by the urgency of special symptoms, such as great heat or great cephalalgia. Usually, ice-cold water is better even in these cases than ice. If, however, it is decided to use the ice, it may be crushed into small pieces and enveloped in several folds of linen or cotton cloth. If intended for the head, a small towel is usually the best. If intended for the chest and abdomen, a small sheet will be found convenient. Or for either use it may be put into rubber bags impermeable to water. Although they afford great protection to the bedding and clothing, ice-bags are not always to be preferred to the towels and sheets. I think it is some advantage to have the compress wet the skin. In other words, the action of wet cold is often better than the action of dry cold.

The principles, just discussed, regulating the use of water and ice in the stage of effervescence, are applicable also to the stage of defervescence. But during the defervescence the natural demand for water is commonly less urgent than during the previous stage, and greater care must be exercised to prevent any excess in the use of it. The temperature of the patient is now usually much lower, and if enemas are to be given it is usually best to use warm water.

Other fluids besides water are frequently used for sponging either the whole body or some special part of it. Of these the principal ones are alcohol, vinegar, aromatic vinegar, aromatic gin, and Raspail's sedative water, all appropriately diluted. Sponging with these lotions may be done under cover and without worry or fatigue to the patient. Take a clean soft sponge or a soft piece of linen or cotton cloth, saturate it with the lotion, sponge carefully a small portion of the surface of the body, and then wipe it dry with a soft warm towel. Then go through the same process with another part of the surface, and so on until the whole body has been treated. This sponging may be repeated several times during the twenty-four hours if deemed advisable. The vinegar lotions are perhaps most commonly used. Lotions of alcohol, with or without admixture with water, are believed to have a specially

tonic effect on the relaxed skin. Raspail's sedative water has been a favorite with me.

In 1879, Mr. J. Livingston, a citizen of New Orleans, claimed to have discovered a specific cure for yellow fever in the thorough application to the surface of the body of a mixture of equal parts of water of ammonia and spirit of camphor. He had reached the conclusion that the poison of yellow fever is an acid poison, and he made use of the water of ammonia because he argued that by its alkaline property it would neutralize this acid poison, and for the further reason that by its property of rapid evaporation it would lower the febrile temperature. He went so far as to claim that it acted not simply on the surface to which it was applied, but that it penetrated through the pores of the skin into the blood itself. He states that after two applications of his mixture of ammonia-water and spirit of camphor, an hour apart, in actual cases, all the pains were permanently relieved, and that the fever subsided, never to rise again. I give this for whatever it may prove to be worth.

The Use of Food.—The regulation of the diet during the first stage of yellow fever is regarded by many practitioners as a very simple matter, it having been settled by the great majority of authorities that it is the safest and the best plan to give no food of any kind whatever; the only exceptions usually allowed being in the case of young children and in the case of persons greatly debilitated before the access of the fever. I have seen infants at the breast pass through attacks of yellow fever to prompt recovery, throwing up black vomit frequently and freely, and nursing as regularly and heartily as if there was nothing the matter with them. The safety-valve in these cases was the continued activity of the kidneys. In spite, however, of the general consensus of opinion in regard to this problem, I am not satisfied that it is the best policy to deny food to yellow-fever patients, even during the stage of febrile effervescence.

Yellow fever is a profoundly adynamic disease. This is shown by the feeble heart and by the great exhaustion that follows any considerable exertion. The flux of blood from the stomach and other organs, and the flux of albumin from the kidneys, are terrible drains on the strength of the patient. It is true that these fluxes do not play a prominent part in the first stage of the fever; but it would seem to be the dictate of wise foresight to anticipate their advent, and to fortify the organism in advance as much as possible, so as to make it strong to resist their encroachments when they do make their appearance. I do not forget that the stomach is not always in a condition to receive and digest food; but, on the other hand, it is often able to do a reasonable amount of this sort of work, and advantage may be taken of such opportunities as present themselves to look after the patient's nourishment.

During the stage of defervescence the strength of the patient must be economized and fostered in every available way. At the beginning of this stage, during the period of calm, there is apt to be a revival of the appetite, and it may become importunate. This importunity is to be partly resisted and partly gratified. In other words, food must be given, but it must be given with much care, so as not to tax too heavily the debilitated stomach. As the stomach shows more and more tolerance for food, it may be given more and more freely; but it is not to be forgotten that a fit of indigestion and emesis might turn the scales the wrong way and precipitate a fatal termination of the case.

There can be no question as to what constitutes the most appropriate diet. Milk, pure, fresh, sweet milk, is better relished, agrees better with the debilitated stomach, and is easier of assimilation than anything else. It is Nature's favorite food for all the species of the great family of mammals to which man belongs. Fresh buttermilk has not been much used in yellow fever, but where it is well relished by the patient and well borne by the stomach it would probably make an admirable article of diet.

It is best to suit the temperature of the milk to the appetite of the patient. It will usually be preferred pleasantly cool. It may be given without any sort of admixture; but if there is much gastric acidity, it may be mixed with lime-water, or alternately with a solution of sodium bicarbonate. Given cool and in considerable quantities, it will largely take the place of other beverages—it is drink as well as food. If the digestion is much impaired, peptonized milk might be given. Milk is, indeed, the ideal food in yellow fever. It is pleasant to take, it is nourishing, it is easily digested, and it is believed to exert some favorable influence over the kidneys. As is well known, it is the favorite diet in Bright's disease.

Other available articles of diet are meat-juice and beef peptonoids. Ducro's elixir has been favorably mentioned. Warm chicken broth is sometimes specially palatable, and the preferences of the appetite are always to be consulted and respected. When food is relished and easily digested, it is certain to do good, but care must be taken not to tax the digestive organs beyond their capacity; and any feeling of gastric fulness or discomfort is an indication that is not to be disregarded. No solid food is ever to be allowed until all danger is over.

THE TREATMENT OF THE TYPICAL FORM.

In yellow fever it is in the typical form alone that any considerable field is found for the application of the resources of practical therapeutics, and it is accordingly in connection with this form that most of the problems involved in the treatment of this disease will be discussed.

The Stage of Effervescence.—This stage, as already explained, ends

usually on the fourth day. It includes the chill which is so common at the outset, and is followed by the calm which introduces the next stage.

The peculiarity of the chill in yellow fever is that it often occurs in the night and at any hour of the night, very often after midnight. It may, however, occur at any hour during the daytime. This is in contrast with malarial chills, which occur most frequently in the morning. In some cases the chill is hardly perceptible, and it is usually brief and of only moderate severity. Occasionally it is protracted to considerable length, with imperfect reaction and alternate shiverings and flashes of heat. It is very rarely that the patient is seen by the physician during the chill, and hence the chill seldom receives treatment. In the mean time, however, it is the universal custom amongst the people of the Southern States to treat the chill promptly with a hot mustard foot-bath. The patient is placed in a chair with his feet in a tub of water as hot as he can bear it, and in which mustard has been liberally mixed. The patient, the chair, and the tub are enveloped in a large blanket gathered closely about the neck and falling down to the floor, and the feet and legs up to the knees are briskly rubbed by an attendant. The hot water to the feet and legs, and the hot vapor that encompasses the patient's body under the blanket, soon provoke copious perspiration, which is sometimes still further encouraged by the administration of some hot tea, usually orange-leaf tea, or some hot lemonade. When the chill passes off, which it usually does very promptly, the patient, already in a hot fever and wet with sweat, is wiped off with dry towels, and put to bed and covered with blankets. Here the sweat is maintained by abundant covering and an occasional draught of some hot drink; and in this condition he is usually found by the physician on his first visit.

In Havana this custom of the universal hot foot-bath does not obtain. It is spoken of favorably by a few of my correspondents, but is dismissed by the majority of them as of no consequence. It is doubtless true that in the larger number of cases the hot foot-bath and the hot drinks are not of any special value. At the same time, it can hardly be charged that in any class of cases they are productive of positive harm; and it would seem that their influence might be beneficial in cases in which the chill is severe, or in cases in which the reaction is delayed, or in cases in which there is considerable pain in the head and back, due presumably to cerebro-spinal congestion.

It is not desirable that the free perspiration thus established shall be suddenly checked. While excessive perspiration is not to be encouraged, it is desirable that the skin shall be kept soft and moist. The evaporation of the surface moisture must to some extent reduce the superficial heat. Nevertheless, the hot skin remains hot and the perspiration is in no way critical.

After the chill there is very rarely further occasion for the use of the hot pediluvium and the hot drinks. But if the feet should get cold, or if the cerebral and lumbar pains are intense, or if the skin should become obstinately hot and dry, some authorities hold that it is good practice to repeat this treatment even more than once, only on these subsequent occasions the patient is not moved from his bed to receive it. My own opinion is that under the conditions mentioned cold sponging of the body and cold compresses to the head are more pleasant to the patient, and at the same time more efficacious. In some cases cold applications may be made to the head, and at the same time hot applications to the feet.

The next question for consideration is whether or not to give a preliminary emetic. The abstract propriety of this is usually admitted by Southern physicians in cases where there is a furred tongue or a torpid liver or a stomach overloaded with undigested food. Nevertheless, in actual practice amongst us emetics are not often administered. In Havana the preliminary emetic is much more common, and it is hardly ever omitted by those physicians who have become thorough advocates of the eliminative treatment. Ipecacuanha is the emetic usually preferred, 40 grains in two powders given with ten to twenty minutes between them, with some hot beverage to facilitate the emesis.

If a great many yellow-fever physicians fail to give the preliminary emetic, none of them fail to give the preliminary purgative. If an emetic has been given, it is necessary to wait a few hours, from three to six, until the gastric irritation and nausea have subsided; but some practitioners give the emetic the first day and the purgative on the second. When no emetic is prescribed, the purgative is given as promptly as possible, sometimes before the subsidence of the chill if the case is seen so soon as that. It is held by all authorities that the purgative should be of such character as to act speedily and thoroughly, so as to sweep from the alimentary canal all the materials within it. The purgative action having been obtained, it is almost the universal custom in the South not to give any more purgative medicine during the entire subsequent progress of the fever, unless there is some clear indication for doing so (Drs. Ogier, Simmons, Thornton, Wall). In Havana the advocates of the eliminative treatment sometimes continue the daily administration of purgatives for several days. Some of them, however, content themselves with the daily administration of enemas.

In the Southern States a mercurial purgative is generally preferred, either calomel alone in doses of from 10 to 30 grains, or calomel in combination with some vegetable cathartic. It was formerly a very common practice in Mobile and Charleston and other Southern cities to use the combination of calomel and quinine recommended by

Blair, who employed it in British Guiana in 1851–53—namely, 20 grains of calomel and 24 grains of quinine at a single dose. By Blair this dose was often repeated, and even more than once. But in this respect his example has not been much followed in the South. Dr. Simmons still prefers this combination for the preliminary purgative. Dr. Ogier uses the following combination: Take of calomel 10 grains; of resin of podophyllum, ½ grain; of pulverized ipecac, ¼ grain; of extract of hyoscyamus, 3 grains. Mix and take at one dose in a capsule.

Dr. Thornton prefers a mercurial purgative, but mentions no special combination. If the mercurial purgative fails to act in about six hours, it is assisted by a dose of castor oil or a dose of some saline or by an enema.

Next to such mercurials as have been indicated, the most popular preliminary purgative is castor oil, sometimes in very large doses, as much as 4 fluidounces, and at other times in very small doses, as ½ ounce only. Comparatively large doses of castor oil act more efficiently and more pleasantly than very small doses, and there is very little danger of hypercatharsis from it. At the same time, a dose of 2 ounces is sufficient for most cases, and 1 ounce usually acts well.

Saline purgatives are very frequently used, although it has been urged that in their cathartic effects they are too unmanageable to be generally adopted. Magnesium citrate and sodium sulphate are the salines most commonly selected.

In my own opinion it is really a matter of very little importance what purgative is employed, provided sufficient doses are given to secure thorough evacuation of the bowels.

In Havana it is a very common practice to repeat the purgatives from day to day, so as to secure daily evacuations of the bowels. In favor of this practice two arguments have been urged: (1) That in this way, to a considerable extent, the hypothetical yellow-fever germs, along with the pathogenic ptomaïnes which they generate, are swept out of the body, and the absorption into the circulation of these ptomaïnes measurably prevented. (2) That in this way, to a considerable extent, we secure the depuration of the blood from the accumulated products of the retrograde metamorphosis of the albuminoid tissues, which depuration is normally performed by the liver and the kidneys, now so crippled as not to be able to do this work efficiently. These arguments are very plausible, but I am not aware of the existence of any conclusive clinical proof of the advantages to be derived from copious and repeated purgings. As a rule, I like to see the bowels act moderately every day or every second day, but I would use only the mildest means to secure this result.

The chill passes rapidly. Just as rapidly comes the fever. Almost at a single bound the temperature and the pulse—the witnesses and the exponents of the fever—reach their highest elevation; and then very soon, in a large majority of cases, they begin to decline. The average of highest temperatures is below 104° Fahr. The temperature-ranges furnish very valuable prognostic indications. If the highest temperature reaches 105° or more, the patient is almost certain to die. Any temperature between 104° and 105° shows that the patient is in very great danger, the mortality-rate in such cases being about 50 per cent. Between 103° and 104° the mortality-rate is about 25 per cent. When the highest temperature is below 103°, nearly all of the cases recover.

Since high temperatures foreshadow such unfortunate results, the inclination to employ antipyretic agents in the treatment of this malady is a very natural one. In the mean time, however, it must be remembered that it is not the heat that kills the patient; and, on the other hand, it is safe to assume that the high temperatures and the fatal terminations are dependent on common causes, amongst which the most important are perhaps the pathological lesions in the vaso-motor and great sympathetic nerve-centres. If by the abstraction of heat from the body we could restore to their physiological integrity the organs engaged in its production, then the antipyretic treatment would be specific, and yellow fever would be robbed of its terrors. But the treatment by the use of antipyretic drugs has not been attended with any marked success. It is possible in this way to reduce the temperature, but to accomplish this very large doses of these remedies are required, and the antipyretic effects obtained are not lasting. If any advantage is gained by the temporary amelioration of the febrile heat, it is more than counterbalanced by the injury inflicted on the nervous system.

Notwithstanding these considerations in regard to antipyretics, there are skilful practitioners who in this stage of the fever employ febrifuge mixtures—not in large antipyretic doses with the intention of jugulating the fever, but under the belief that in moderate amounts they influence favorably the progress of the case. Dr. Ogier recommends an aconite mixture, as follows:

℞. Tr. aconiti, fʒss;
Olei sassafras., ♏vj;
Syrup. lactucarium (Aubergier), fʒss;
Aquæ destillat., fʒij.—**M.**

Sig. A tea-spoonful every two hours.

Dr. Simmons recommends mild neutral or alkaline diaphoretics, as follows:

℞. Potassii citratis, ʒij;
Potassii chloratis, ʒijss;
Spirit. æther. nitros., fʒj;
Aq. camphoræ, fʒvj.—M.
Sig. A dessert-spoonful every two or three hours.

℞. Sodii sulphitis, ʒij;
Spirit. æther. nitros., fʒss;
Liquor. ammonii acetatis, fʒiij;
Aq. destillat., fʒij.—M.
Sig. A table-spoonful every two or three hours.

Dr. Wall prefers antipyrine.

Of late years the alkaline and antiseptic mixture, of which the formula is given in the communication of Dr. Burgess, has to a large extent taken the place of such febrifuges as those mentioned above. It was first used in Havana in 1888, and in that same year was also used in Alabama and Florida. The dose of this mixture is 1½ ounces, and it is given ice cold. In Mercedes Hospital the rule to give the medicine every hour is so rigorously construed that if the patient is asleep when the time comes he is awakened to take it. When it is used it nearly crowds out all other medicines, and, as the amount of water in it is considerable, it often happens that but little additional water is needed.

The theory of its action is that the mercury bichloride destroys in the stomach and duodenum the germs which produce the disease, while the sodium bicarbonate neutralizes the acid condition of the system. It is further affirmed by those who have used it that it acts as an efficient diuretic, and that it exercises a notable influence in the prevention of albuminuria. It is also stated that it acts as a laxative on the bowels, sometimes even causing diarrhœa; which is an indication that it is not absorbed and calls for its temporary suspension. If this medicine even approximately fulfils the claims that have been made for it in the treatment of yellow fever, it will be hard to estimate it too highly. In the mean time, one word in regard to the acid diathesis in yellow fever, and another in regard to the germicidal theory of treatment.

(1) The fluids of the stomach are naturally acid, and so is the urine; but these fluids become more intensely acid as the disease progresses. Normally, the contents of the bowels have an alkaline reaction, and they remain alkaline in yellow fever until the disease is considerably advanced, and usually until the acid black vomit, instead of being thrown up, passes down into the bowels. In advanced stages

of very severe cases it is stated that the blood also becomes acid. The acid diathesis, then, is not present at the beginning of the attack, and becomes fully established only in the stage of defervescence. It is doubtless wise, however, to anticipate the acid period by the administration of alkalies with a view to its prevention.

(2) Admitting that the germs which generate the ptomaïne which generates the disease can be reached in the stomach or in other parts of the alimentary canal by germicides sufficiently powerful for their destruction, still, it does not follow that the germicidal treatment would have all the advantages we are at first thought inclined to ascribe to it. I think it is almost certain that, in spite of any possible slaughter of germs, the disease, once established, will run on through all of its regular stages until the susceptibility of the system is exhausted; that is to say, until the period of immunity is reached. I do not mean to maintain that germicidal remedies may not be useful in yellow fever, but only that we cannot expect them to jugulate the disease. The yellow-fever germs are probably destroyed in the system before the end of the stage of effervescence—poisoned either by the products of their own malignant energy or else unable to withstand the acid diathesis which they have indirectly established.

During the febrile commotion of this first stage of yellow fever there is very often an evolution of intense cephalalgias and rachalgias, and sundry other irritations and discomforts. These very often yield to the affusions and lotions and cold compresses already described. But sometimes they continue troublesome after these remedies have been faithfully employed, and it then becomes necessary, or seems at least to be expedient, to invoke the assistance of analgesics and nervous sedatives. Of this class of remedies antipyrine seems to have given the best results. It is administered in doses of from 5 to 15 grains, and repeated as the occasion seems to require. It can usually be given by the mouth, but may also be given in larger doses by enema.

Opium and morphine were once freely used in yellow fever, but of late years they are hardly mentioned in connection with it, except as prohibited drugs. They may produce nausea; they may check the secretions, especially that of the kidneys; and there is no doubt that if unskilfully used they are dangerous remedies. Nevertheless, there is an occasional case in which they seem to be demanded, in which they bring relief when all other medicines have failed to do so. In this connection I cannot do better than to quote the words of one of my correspondents, Dr. Thornton: "Opiates, in my judgment, are demanded when muscular pain is so intense and continuous as to prevent rest and sleep, and when other sedatives have failed to bring relief. I was utterly opposed to the use of opiates until I experienced the benefit afforded by one dose of morphine in my own person—the

fourth or the third of a grain—after I had been suffering day and night for forty-eight hours. The pains in my back and legs and other parts of my body were so intense that I told my physician that I must have relief even if it resulted in my death. Late one night he gave me the dose mentioned in a solution of hyoscyamus. It brought exemption from pain, and it brought sleep, the most refreshing sleep I had had during my illness. This experience changed my mind in regard to the administration of opiates in yellow fever. Of course the best judgment of the physician must be exercised on this important point; but I am confident that writers on the treatment of yellow fever have ignored or condemned this drug too much. At the same time I am well aware of the dangers that attend its abuse."

Vomiting is not usually a distressing symptom in this stage of the fever, and when it is so it is not usually a dangerous symptom. Nevertheless, it always excites apprehension that it may lead on to the dreaded black vomit, and active steps are deemed necessary to arrest it. Copious draughts of hot water until the stomach is thoroughly washed out are usually sufficient to bring relief; and this procedure may be subsequently aided by cold compresses to the epigastrium, or Rivière's potion may be tried.

The Stage of Defervescence.—Just as the chill is the introduction to the stage of effervescence, so is the calm the introduction to the stage of defervescence. It is sometimes so little marked as not to attract special attention; sometimes it is of very brief duration, lasting only an hour or two; and sometimes it is protracted to twelve hours or more. It is one of the most notable features in the evolution of a case of yellow fever, and is in striking contrast with the stormy manifestations which have preceded it. In the milder cases it is the immediate prelude of convalescence, but in most cases of the typical form it is simply the beginning of the stage of defervescence, which runs through a course of from three to six days. While the calm lasts but little is necessary in the way of treatment. The patient must be kept in bed. Sternberg's mixture may be continued, or, as Dr. Wall phrases it, we may pursue a course of masterly inactivity, waiting to see which way the scales will turn. At this time the patient's appetite is apt to revive, and it may become importunate. But under no circumstances must any solid food be allowed. Nothing but milk is admissible, and care must be taken to give this in small quantities at a time, so as not to tax too heavily the debilitated stomach. If the stomach shows sufficient tolerance for it, it may then be given more freely. Some prefer to combine lime-water with the milk. If this is done, Sternberg's mixture may be discontinued. The period of calm is sometimes characterized as a period of remission. There is, indeed, a remission in the urgency of many of the symptoms, but it

is not, in any proper sense of the words, a period of febrile remission. True, the pulse has now fallen down into the neighborhood of 80, and the temperature is perhaps down to 102°, or even lower. But, however severe the subsequent course of the attack may prove to be, neither the pulse nor the temperature are likely to rise again. On the contrary, their tendency is to decline more and more to the end, whether the end be in recovery or in death, although in a few cases just before the fatal termination there may be a sharp and sudden acceleration of the pulse-rate.

The stage of defervescence is the stage of danger and of dangerous complications—of suppression of the urine, of hæmorrhages and black vomit, of heart failure and yellow discoloration, and the stage in which death claims so many victims. It therefore requires the most assiduous and skilful medical management.

In severe cases the acid diathesis is now fully established—if not at the beginning of this stage, at any rate before the end of it—and the propriety of alkaline drinks is hence very manifest. The natural alkaline waters may be sufficient to meet the indications, or sodium bicarbonate may be given in large dilution to the extent of 30, 60, or 120 grains in the twenty-four hours. Our hope is that this alkaline treatment may to some extent ward off the mischievous influences of the acid diathesis on the blood and the glandular organs, and especially that it may prevent or lessen the dreaded pathological changes to which the kidneys are so extremely liable. We continue the alkaline treatment throughout this stage of the disease, or as long as the condition of the patient remains precarious, or unless the occurrence of diarrhœa demands its temporary or permanent suspension.

The strength of the patient must be sustained in all possible ways. If the heart shows signs of debility, and especially if a very feeble pulse and sighing respiration come together, we must resort to the systematic use of alcoholic beverages. They should be made into pleasant combinations, and while their effect is to be carefully watched, if they are really needed and are well tolerated they should be given in sufficient quantity to get from them some appreciable influence. If they should prove disagreeable to the patient, or if any bad symptoms can be traced to their administration, they must be discontinued. Good French brandy is one of the best of these beverages, but I more commonly select good whiskey, because it is much more easily obtained. Wines, especially dry wines, when they suit the patient's taste, are not objectionable; but, as a rule, Americans are not partial to wine. Champagne has been generally lauded amongst us, especially when the symptoms herald the approach of black vomit or after the black vomit has made its appearance. It suits some cases admirably, and is relished above all other drinks; but I think its high reputation has

not been altogether merited. It may be given in small quantities ice cold, or frozen champagne (champagne frappé) may be used in teaspoonful doses frequently repeated. Care should be taken that the champagne is dry and of good quality. The cheap champagne that is often sent by charitable people to communities stricken with yellow fever is worse than useless. It has occurred to me that wine of coca might sometimes be useful, but I have had no experience with it. If stimulants are needed at all in yellow fever, I believe that alcoholic stimulants are to be preferred to all others. They are usually pleasanter to take, and their influence is more stable and lasting. They are more or less antidotal to many poisons. For example, they are the best remedies we have for snake-bites and for the cadaveric infection received through dissection-wounds. In the mean time, it is not to be forgotten that the majority of Havana physicians do not accord to alcoholic beverages a very prominent place in the treatment of yellow fever. I may mention here again the combination of cognac, coffee, and coca recommended by Drs. La Guarda and Martinez. When the need of stimulants is very urgent, and the stomach refuses to tolerate them, they may be administered by enema or hypodermically.

During this stage great advantage may often be obtained by the judicious use of the lotions, affusions, and compresses already mentioned in connection with the treatment of the preceding stage—aromatic vinegar, aromatic gin, Raspail's sedative water, etc.

If we can guide the patient through this stage, so as to avoid its dangers on each day, we are fortunate. But if the dangers come in spite of all our skill, what then? If the liver fills up with fat and ceases to perform its depurative functions, ceases to construct urea and bile and glycogen out of the products of retrograde metamorphosis; if the blood becomes loaded with effete materials, and the red corpuscles begin to lose their hæmaglobin, and all the tissues turn yellow; if the dark, grumous blood begins to ooze from the mouth and the nose, and in women from the uterine cavity; if the stomach begins to utter complaints in sensations of intolerable oppression, weight, and burning, and the white vomit, and then the terrible black vomit, make their appearance; and if the urine becomes scanty and more scanty from day to day, and heavily loaded with albumin;—if these things come to pass, what then? The outlook then becomes gloomy indeed, but we must do the best we can. Not many of these cases recover, but a few of them struggle back to the bright precincts of the cheerful day. With all this turmoil of symptoms of bad omen, as long as the kidneys secrete a reasonable amount of urine, even if it does contain an abundance of albumin, the case is not absolutely desperate. It is not the white hæmorrhage of the albumin in the urine that kills the patient, any more than it is the black hæmorrhage of the black vomit that kills

him. But after the complete suppression of the urine I have never known a single case to recover. With the stoppage of the urinary secretion there is doubtless such a stoppage of the depuration of the blood as is incompatible with the continued vitality of the organism. The organic functions are suspended, not simply because the organs have quit work, but because they are suffering from such extensive lesions that they are no longer able to work; and no stimulus known to our therapeutics can lash them again into even temporary activity. If we could only gain a little time, if we could only keep the patient alive for a few days, then all would come round right, the strangest of all the strange things about this strange malady being the wonderful facility with which these crippled organs recover their physiological integrity and resume their wonted functions when the pathological processes have spent their malignant energy.

The treatment for the prevention of black vomit begins as soon as the preliminary symptoms are observed. To relieve the gastric distress we may give bits of crushed ice or of champagne frappé, and apply ice-bags or crushed ice folded in a sheet to the epigastrium. I have kept crushed ice to the epigastrium for sixty consecutive hours, and have been rewarded by the recovery of my patient after copious black vomit, not accompanied by suppression of urine. There is one rule that is never to be forgotten in regard to this treatment. If the ice is not agreeable to the patient, its application should not be continued. I do not know that large draughts of very hot water have ever been tried for black vomit. It has a good effect in some other hæmorrhages. What effect it would have in the gastric hæmorrhage of yellow fever can only be conjectured. Of course it would be promptly thrown up again, and for this reason most yellow-fever doctors would hesitate to give it. But I am satisfied that the mere act of emesis does not do the patient any great damage, and I am also satisfied that the gastric hæmorrhage is not sufficient in amount in most cases to determine the fatal result. I have already stated that if the kidneys are not too badly crippled, black-vomit cases may recover. It is only as the most prominent exponent of the general condition that black vomit has won such a dreadful reputation as the precursor and harbinger of dissolution.

It has been common when the gastric trouble begins to apply blisters to the epigastrium. They are recommended by Dr. Ogier, Dr. Simmons, and Dr. Thornton, and are mentioned with some favor by several of my Havana correspondents. Nevertheless, I must be allowed to say that I have never seen them do any good. Dr. Ogier recommends that the whole chest and abdomen shall be rubbed with a strong croton-oil liniment or covered with a thapsia plaster for eight or ten hours until a rash appears on the skin, when generally, he says,

all urgent symptoms disappear. Ergot has been found so efficient as a hæmostatic agent that it has been freely used to check the hæmorrhages of yellow fever, especially the black vomit. This drug acts by causing contraction of the capillary blood-vessels; but in yellow fever the lesions of the vaso motor nerve-centres and the lesions of the capillary vessels themselves are of such a grave character that in many cases the ergot produces very little effect. It may be used, however, in default of anything better, and when used should be given in decided doses, say from 40 to 60 drops of a good fluid extract; and it is usually best to give it by hypodermic injection.

The great problem in the treatment of yellow fever is how to relieve the embarrassed kidneys. Even the gastric trouble, of which we have just spoken, is but a consequence of this. Says Dr. Wall: "I look upon the gastric trouble in the beginning as only a symptom of the nephritic inflammation, being also a marked symptom in acute nephritis of idiopathic origin. The hæmorrhages, black vomit, etc. are the results of changes in the blood, produced by the retention of excrementitious matters which the diseased kidneys have failed to eliminate." When the urine begins to diminish in quantity and the albumin to increase, we begin to think about the administration of diuretics, but it is doubtful if they ever do any good. The kidneys are already in a state of hyperæmia, and the diminished excretion of urine is due to destructive lesions of the secretory apparatus. The application of inunctions and frictions and dry cups and turpentine stupes to the lumbar region may be tried, and the colon might be flushed with very large enemas of hot water, with the hope of relieving the condition of the kidneys.

The Stage of Convalescence.—Convalescence in yellow fever is usually rapid. Indeed, it is usually so rapid as to provoke surprise when we remember the number and the gravity of the pathological lesions which characterize the disease. The emaciation is usually not great, and there is an abundant store of fat to supply fuel to keep up the animal heat. The kidneys in a few days resume their normal functions, and secrete urine in normal quantity and free from albumin; and dropsy is not among the sequels of yellow fever. The liver seems very soon to disembarrass itself of its load of fat, and promptly begins the depuration of the blood by the making of bile and urea. Occasionally, however, the jaundice is intense and clings to the patient for several weeks. The functions of the great sympathetic nerve-centres regain their physiological integrity more slowly, and the temperature and pulse continue subnormal, sometimes for weeks, especially the pulse. The appetite is promptly re-established, and sometimes becomes importunate. During the earlier days of the convalescence all importunities of the appetite must be firmly resisted, because a little imprudence

may bring on indigestion, and indigestion may provoke vomiting and relapse; and relapses in yellow fever are very dangerous, in many cases fatal. For two or three days all solid food must be prohibited. Milk is still the best food, and may be taken frequently in moderate quantities. If meat-broths suit the appetite better, they are not objectionable. As soon as the convalescence is fairly established soft-boiled eggs may be allowed, and then tender meats, and a little later fruits and vegetables, with crackers and toasted bread.

THE TREATMENT OF THE MILD FORM.

The mild form of yellow fever requires no special medical treatment. It will get well with any sort of treatment or with no treatment at all. We cannot always tell at the beginning what cases are going to be mild. We may therefore give a preliminary purgative, followed by some alkaline drinks or by Sternberg's mixture, and watch the developments. If the chill is short and slight; if the pulse is not more than a few beats above one hundred to the minute; if the highest temperature is below 103° Fahr.; if the pains in the back and head are not distressing; if the face and the eyes retain their natural expression; if all of the secretory and excretory functions of the body seem to be in good condition;—in a word, if all the symptoms are of mild character during the first day, and especially if they so continue during the second day, we may conclude that the patient is in no danger, and we may content ourselves with a milk diet for a few days, and with proper attention to the patient's environment.

How are we to know that these mild cases are cases of yellow fever? Positive diagnosis is difficult. But if they occur in the midst of a yellow-fever epidemic; if the patients have been exposed to yellow-fever infection; if the fever, however slight, is a fever of one paroxysm; if there is any manifest want of parallelism between the pulse and the temperature,—all these facts are suggestive of yellow fever. If there is a trace of albumin in the urine on the third day, the evidence becomes conclusive.

But is there such a thing as yellow fever without albumin in the urine? I myself have not seen many very mild cases of yellow fever, and I have never seen a case that I regarded as yellow fever in which the albuminuric complication was not found if it was sufficiently sought for. Still, I am not prepared to say that there are no such cases. Dr. Wall tells us that such non-albuminuric cases were not uncommon, according to his experience, in the Tampa epidemic of 1887. I can only remark in passing that the epidemic of 1887–88 in Florida was the mildest in our whole yellow-fever history. In the mean time, we have seen Drs. Finlay and Delgado, with their long experience in Havana, tabulating their first form of the fever as non-albuminuric,

characterized by the absence of albumin during the whole course of the disease, or by its appearance only in insignificant amount. If such cases occur, they are practically of little importance unless they should happen to be the first cases in a community in which no yellow fever was known to exist; and I have my doubts whether even then they would generate sufficient poison to inaugurate an epidemic.

I think it probable that albumin is not discovered in the urine sometimes in mild cases of yellow fever because the tests are not carefully applied. Dr. Guiteras tells us that in his Florida experience, during the same epidemic of which Dr. Wall writes, he always found albumin, and frequently on the second day. He used Heller's test.

THE TREATMENT OF THE MALIGNANT FORM.

In the malignant form of yellow fever all treatment is found to be unavailing and impotent. The vital energies are overwhelmed from the beginning of the attack. There is a sudden invasion by the fever, with or without severe chill, with intense pain in the head and eyeballs, accompanied by sickness and vomiting. Sometimes the fever is ushered in by convulsions or apoplectic stupor or outrageous delirium. The whole appearance is ghastly, and there is a faint nauseous odor from the body. The skin becomes rapidly yellow, and then bronzed or mottled by ecchymotic effusions of blood, and at the same time so torpid as to be insensible to the stimulation of blisters and sinapisms. The conjunctivæ become intensely yellow, and the conjunctival veins turgid with blood, and the face becomes swollen and discolored like that of a man after a long debauch. The stomach becomes greatly distressed, with eructations or explosions of flatus, and black vomit rapidly supervenes, together with black, watery, shreddy stools. Hæmorrhages are common from the natural outlets or into the connective tissue beneath the skin or amongst the muscles. And, finally, death comes mercifully to end the terrible struggle—most usually on the third or fourth day, but sometimes before the expiration of the first day.

Leading Indications for the Treatment of Yellow Fever.

In arranging a theoretical basis upon which to formulate a plan for the treatment of yellow fever, it is important to take into account the leading indications furnished by the clinical history of the disease. I have endeavored to express these indications compendiously in the subjoined propositions:

(1) Yellow fever is a specific fever. It is caused by the pathogenic action on the human organism of a specific poison, which is probably a ptomaïne or a toxalbumin generated by a specific germ or microbe—bacterium or bacillus. Both the yellow-fever poison and the microbe which generates it have up to this time escaped scientific demonstration.

But we postulate the microbe because it is certain that with the concurrence of favorable conditions the poison is rapidly multiplied and increased, and this necessarily presupposes the agency of a living organism. And we postulate the ptomaïne because, in regard to its propagation in space and time, and in regard to its genesis and evolution in individual patients, yellow fever is strictly analogous to other specific fevers which are known to be produced by germ-generated ptomaïnes, and because, indeed, all pathogenic microbes are pathogenic only through the agency of the pathogenic ptomaïnes. It is commonly believed that the yellow-fever microbe finds its favorite habitat somewhere within the human organism—that within that habitat it feeds and grows and multiplies its generations, and there in the processes of its growth and reproduction elaborates the deadly yellow-fever ptomaïne. Accepting this hypothesis, it is easy to see that the treatment of yellow fever would be easy if our materia medica afforded agents competent to destroy the yellow-fever microbes within the organism, to neutralize the ptomaïne within the organism, or to eliminate the microbe or the ptomaïne, either or both, from the organism. Unfortunately, however, we have no such therapeutic agents, and we must treat the patient instead of the microbe or the ptomaïne. We have a large number of specific fevers, and it is a remarkable fact that not a single one of them is amenable to specific treatment, unless we make an exception in regard to quinine in the treatment of the malarial fevers; and this is probably not a genuine exception.

(2) Yellow fever, like all other specific fevers, runs a specific course, and is characterized by a specific symptomatology and a specific concourse of pathological lesions. It cannot be aborted in its initial stages; it cannot be cut short at any period of its evolution. It subsides only when the period of immunity is reached, and when the patient is no longer susceptible to the pathogenic influence of the producing poison. The cause of this immunity we do not know, but it is a very remarkable and a very beneficent concomitant of all the specific fevers. If the patient reaches the period of immunity before the vital organs have suffered some mortal injury, he recovers, and the convalescence is usually rapid. If the mortal injury comes before the exhaustion of susceptibility, the patient dies. In the treatment of yellow fever it is the office of the wise and skilful physician to guide the patient with all possible care through the multiform and multitudinous dangers that encompass the road he has to travel, and every rational method of treatment under such conditions must of necessity be to a large degree expectant and symptomatic.

(3) Yellow fever is a fever of profoundly adynamic type, with lethargy and torpor and debility of all the tissues and organs of the suffering body. In the more malignant cases the functions that resist

death and all the vital energies of the patient are in a few days overwhelmed and annihilated. In less severe cases the adynamic tendency constitutes one of the remarkable characteristics of the malady. Even in the mildest cases this adynamic tendency is discoverable; and in the treatment of this fever, therefore, all depressing and powerfully perturbative remedies are to be avoided, and assiduous care must be exercised to conserve and sustain the vital energies of the patient.

(4) The depressing and sedative influence of the poison shows itself prominently in the course of the temperature, which frequently reaches its highest point within a few hours after the beginning of the attack, which in an immense majority of the cases reaches its highest point before the end of the first day, and in which the thermometric maximum is rarely delayed until the third day. This maximum once reached, the tendency of the temperature is to decline steadily and day by day until it reaches or falls below the normal thermometric degree. Aside from the daily morning and evening perturbations, which are less marked than in most other fevers, there is never a second rise of fever, unless it is caused by some intercurrent inflammation or other intercurrent cause. This natural tendency toward defervescence is not to be forgotten in discussing the propriety of administering antipyretic drugs.

(5) The depressing and sedative influence of the yellow-fever poison shows itself still more notably in the course of the pulse, which invariably reaches its maximum in a few hours after the beginning of the attack, and then declines steadily until it reaches the normal frequency, or, as is still more frequently the case, until it falls considerably below the normal even in cases that recover. This abnormally slow pulse often continues for several days, and sometimes for weeks, after the establishment of convalescence. Sometimes shortly before the termination of fatal cases some intercurrent complication may occasion a second rise of the pulse, and this without any recrudescence of the febrile temperature. The pulse is not only slow, but it is also wanting in force and tension, and in malignant cases assumes a gaseous character, as if the arteries were filled with air instead of blood. The indications of treatment furnished by the pulse suggest the administration of restoratives, tonics, and stimulants, and that arterial sedatives should be used only in exceptional cases, and with great caution if they are used at all.

(6) Yellow fever is not in any decided way an inflammatory disease, although intercurrent inflammation, internal or external, may enter as a complicating factor in some cases. Inflammations of internal organs may be attended with considerable danger. The danger from inflammations of external organs is much less. In uncomplicated yellow fever, therefore, antiphlogistic treatment is contraindicated.

(7) While yellow fever is not characterized by the active and massive congestions so common in the malarial fevers, nevertheless capillary congestion or hyperæmia or blood-stasis of a passive kind is one of the most remarkable features of its pathology. This hyperæmia is to be observed in the capillary vessels of the skin and of the mucous membrane, and in the brain and the kidneys. It is due to the debility of the heart, which no longer drives the blood through the arteries with its accustomed energy; to the want of elasticity and resiliency in the arterial tunics; and to the fatty degeneration of the epithelium lining the capillaries, which gives rise to numerous infarctions and ecchymoses. We know of no treatment which has the power to relieve these passive hyperæmias. Such relief, indeed, could be found only in the restoration of the vital energy of the heart and in the re-establishment of the contractility and elasticity of the arterial tunics. In the mean time, the energetic and revulsive treatment found to be useful in malarial congestions has not been found admissible in yellow fever.

(8) In malignant yellow fever there is extensive disorganization of the corpuscular elements of the blood. Without going into details, there is good reason to believe that many of the white corpuscles undergo fatty degeneration; and it is certain that the red corpuscles part with their coloring matter freely, the disengaged hæmoglobin giving the saffron hue to the skin and other tissues. It is also worthy of notice in this connection that in malignant cases of yellow fever the blood does not coagulate or coagulates very imperfectly. It cannot be doubted that in milder cases the same destructive agencies are at work for the degradation and disorganization of the blood, and with results similar in kind, but less in degree. From such considerations as these it follows that remedies which contribute to the preservation and improvement of the blood would seem to be indicated in the treatment of yellow fever. And, indeed, such remedies have been extensively used in yellow fever, but for the most part with very moderate success.

(9) Along with this characteristic depravity of the blood, yellow fever exhibits an unexampled range of hæmorrhages. We have hæmorrhages from all the mucous membranes—from the mouth, the nose, the stomach, the bowels, and the uterus—and from blisters and abrasions of the skin. Doubtless these hæmorrhages are due to two causes—first, to the fluid and disorganized condition of the blood itself, and secondly, to the want of vital tonicity in the walls of the capillary blood-vessels, with the capillary stasis thence resulting. For the arrest of these hæmorrhages, and for the correction of this hæmorrhagic diathesis, iron, ergot, and the mineral and vegetable acids and astringents have been employed.

(10) The pathological aberrations of the liver in yellow fever are quite marked. In fatal cases there is always found to a greater or less

extent fatty degeneration of the hepatic cells and capillaries. In addition to the fat due to local degenerative changes, there is usually found a much larger amount of fat due to the infiltration of fat absorbed from the blood circulating through the portal system of blood-vessels. The presence of so much fat in the liver gives to it that characteristic color which has been likened to boxwood, to new leather, and to *café au lait* At the same time, the proper functions of the organ are either entirely suspended or largely diminished; and this is specially true of the secretion of bile and the construction of urea. It is natural to suppose that, in consequence of this disability of the liver to discharge its usual functions with efficiency, the products of the retrograde metamorphosis of the tissues accumulate in the organism, and so bring about a condition similar to that commonly known as uræmia. In the mean time, there are in the liver no evidences of antecedent inflammation to account for the remarkable pathological changes that are present. The administration of mercury and other cholagogue medicines has not been found to influence materially this condition of the liver. In the mean time, one of the most notable things connected with the clinical history of yellow fever is the ease and rapidity with which this organ, so remarkably affected, returns during a short convalescence to its original integrity.

(11) Next to those found in the liver, the most notable pathological lesions of yellow fever are found in the kidneys. Here we have fatty degeneration of the epithelial cells lining the uriniferous tubules, and at the same time more or less fatty degeneration of the renal parenchyma. *Pari passu* with the progress of these degenerative changes there is a continually increasing percentage of albumin in the urine, with a continually diminishing quantity of urine, which in many fatal cases goes on to complete suppression. Scanty urine with a large percentage of albumin is always a symptom of ominous import. Complete suppression of urine is always fatal. When the kidneys become seriously involved the usual diuretic remedies seem to have very slight power to restore their functional activity. And yet during convalescence the kidneys regain their physiological integrity as rapidly as in the albuminuria of pregnant women after parturition.

(12) The gastric mucous membrane is not inflamed in yellow fever, nor is it congested except in patches here and there. Such congestion as there is, is entirely passive, and is perhaps partly due to obstruction of the portal circulation. Briefly, the pathological changes found in the stomach post-mortem do not account for the embarrassment and distress which it exhibits during the progress of a severe case of yellow fever. There is a feeling of weight and humming and general discomfort, with nausea and intolerance of pressure, which we can only vaguely ascribe to some abnormal condition of the gastric ganglia and the gas-

tric nerves. The welfare of the patient is very largely dependent on the physiological integrity of this organ, and hence it needs to be managed with very wise discretion. It must not be overtaxed with either food or medicine, and whatever complaints it utters, whether in the way of craving or of protest, must receive prompt attention.

(13) The bowels in yellow fever are not usually, in any proper sense of the word, constipated. They are simply lethargic, torpid, sluggish, like so many other organs in this disease, and yield promptly to gentle purgative stimulation. It has been strongly suspected of late years that the yellow-fever microbe has its habitat in the bowels of the yellow-fever patient, and that it generates there the ptomaïne which is subsequently absorbed into the blood with such terrible results to the whole organism—just as a similar genesis is ascribed to typhoid fever. In harmony with this hypothesis, purgatives, and especially hydragogue purgatives, to wash out and expel the offending microbes, would seem to be important agents in the treatment of this malady. But experience does not seem to favor their frequent or protracted use in either typhoid fever or yellow fever.

(14) The functions of the brain and the nervous system generally, especially the functions of the great sympathetic, are all profoundly depressed by the influence of the yellow-fever poison. In many fatal cases evidence is found of intense hyperæmia of the pia mater cerebralis and of the substance of the brain itself, with fatty degeneration of the capillaries, infarctions, and small ecchymoses. These conditions also obtain in the medulla oblongata and in the lumbar portion of the spinal cord—not in the cervical and dorsal portions of the cord. In these lesions we have a large part of the explanation of the headaches, neuralgias, insomnias, and deliriums which are so common in many of the severer cases during life. The involvement of the great sympathetic is shown by the marked lethargy of all the organic functions, by the tendency to cardiac debility, by the sighing respiration, and by the gastric irritability, anorexia, and discomfort. It is consequently a fundamental principle in the treatment of yellow fever that the nervous energy of the patient must be sustained in every possible way—by perfect rest of body and mind; by such nerve tonics and stimulants, judiciously administered, as may seem best adapted to the special exigencies of special cases; and, after the subsidence of the primary fever, by such easily-digested foods as the enfeebled stomach is able to manage and the enfeebled organism to assimilate.

(15) The skin in yellow fever is usually relaxed, and I know of no other disease in which perspiration is so easily induced and maintained, especially during the stage of the primary fever. Sweating in yellow fever is never a critical symptom, as it nearly always is in malarial fevers. Profusely excreted, as it often is, and standing in beads or

drops on the hot skin, evaporation goes on freely, but seems to exert very little influence in cooling the surface of the patient or in reducing the systemic febrile temperature, as determined by the thermometer in the mouth or in the axilla; and the moist skin often imparts a peculiarly hot and pungent sensation to the hand laid upon it. The reaction of the sweat to test-paper is acid. In a few exceptional cases the sweat is cold, colliquative, very profuse, and very persistent. I have known it to be so profuse as not only to wet the clothing and bedding of the patient, but to soak through a thick mattress and drop down in little puddles on the floor under the bed. Such cases always die in a few days. This spontaneous tendency of yellow-fever patients to sweat has seemed to many a natural indication that ought not to be disregarded, and has suggested sweating as a means of cure. With this intention use has been made of hot foot-baths, hot drinks, close rooms, and abundant covering with blankets. It is argued in favor of this treatment that the skin in this way is made to a considerable extent to assume the depurating functions of the kidneys, so that the kidneys in the mean time are relieved of a considerable part of the labor that would otherwise be imposed upon them, and are thus less liable to break down from overwork. It is in accordance also with this view that by a few physicians the use of jaborandi and pilocarpine has been advocated in the treatment of this disease. I know of no statistics of cases that support the superior efficacy of the sweating treatment, and it is now very generally abandoned. Neither do I know to what extent the products of the retrograde metamorphosis of the tissues may be excreted by the process of perspiration; but I suspect that the amount of depuration thus obtained is not very great.

The yellow discoloration of the skin is a notable symptom in this disease, and has given it the name by which it is most commonly known in half a dozen languages. This discoloration is a true hæmatogenous jaundice, and is owing to the diffusion of the coloring matter of the blood. It is not confined to the skin, but extends to all the tissues of the body, especially, after the skin, to the mucous membranes and to the accumulations of fat wherever found. But it is to be borne in mind that in the majority of the cases that recover this yellow discoloration does not present itself at all, or only to a very slight degree. It is apt to show itself in severe and protracted cases. Nevertheless, a considerable number of cases reach a fatal termination without any exhibition of the characteristic color; but such cases turn yellow very rapidly after death, so that all yellow-fever cadavers are yellow.

(16) The vomiting in yellow fever requires some mention. If vomiting occurs at the beginning of an attack, either spontaneously or as the result of an emetic, the vomited matters may occasionally contain bile, but this is by no means the rule. Usually the vomit at this

stage contains only the fluids and solids recently taken into the stomach. Later on, in the stage of calm or of secondary fever in protracted and dangerous cases, a different sort of vomiting may occur. Besides the ingested fluids, a clear, thin, mucous fluid may be thrown up, in which float a few darkish-colored shreds of epithelium. This is known as white vomit, and the included shreds have been likened to bees' wings or spiders' webs. This white vomit is the precursor of the dreaded black vomit, but the black vomit may come without any such forerunner. It is thrown up, this terrible black vomit, without any straining or apparent effort, and often with such force that it is projected to the foot of the bed or against a low ceiling. It is composed of disorganized blood-corpuscles, the coloring matter of the blood, the acids of the stomach, and watery fluid. Upon being allowed to stand for a little while in the receiving vessel, it separates into two parts—a dark granular matter, like coffee-grounds, which sinks to the bottom, and a clear acid, supernatant watery fluid. The amount thrown up is often very considerable, and it has been picturesquely said that along with this so-called gastric hæmorrhage flows away the life of the patient. It is certainly an unfavorable and very dangerous symptom. A few adults and a considerable number of children have black vomit and recover; but, as a rule, it is the harbinger of death. In the mean time, it must be seriously doubted if the amount of blood lost in this way is of sufficient quantity to account for the fatal result that follows. The more probable explanation is, that the black vomit is symptomatic of such a condition of the blood, and of such lesions of the kidneys and the liver, as make recovery almost impossible. The mere act of emesis is of no great consequence, and after the materials composing the black vomit have once found their way into the stomach, their speedy ejection is perhaps beneficial. The first effect of the emesis is at any rate a decided feeling of relief. There are fatal cases of yellow fever without the appearance of black vomit; in some epidemics there are a good many such cases. But I have never seen a post-mortem examination without finding more or less black vomit in the stomach. I have seen the vomit when first thrown up of a bright pink color, but it soon turned black.

(17) The leading pathological lesions found after death in yellow-fever cadavers, as has been already indicated, are lesions of the liver, the kidneys, the brain, the sympathetic ganglia, and the stomach; and the lesions of the stomach are much less prominent than the great distress of that organ during the progress of the disease would lead us to expect. It is worthy of remark that all these organic lesions are associated with fatty degeneration. Indeed, acute fatty degeneration is the cardinal fact in the pathology of yellow fever—fatty degeneration of the secretory cells of the liver, fatty degeneration of the epithelium of

the tubules of the kidneys, fatty degeneration of the ganglions of the great sympathetic nerve, fatty degeneration of the epithelium of the capillary blood-vessels, and fatty degeneration, in a lesser degree, of the muscular fibres of the heart and other organs. In the mean time, the lungs, the spleen, and the bowels show comparatively little evidence of pathological aberration.

(18) The chemical phenomena of yellow fever have not been adequately investigated. We know that notwithstanding the diminished excretion of urea and uric acid there is no accumulation of these compounds in the blood. We know that there is no accumulation in the blood of bile or of cholesterin. We know that there exists a strong tendency in the disease toward the establishment of an acid diathesis; but of the acid or acids concerned we know very little. No researches have been made with a view to the discovery of the yellow-fever ptomaïnes. Indeed, how such a research would be projected is not very evident.

CEREBRO-SPINAL FEVER (CEREBRO-SPINAL MENINGITIS).

By J. C. WILSON, M. D.

The present article includes the treatment of so-called idiopathic cerebro-spinal fever both in its epidemic and its sporadic form. The treatment of tubercular meningitis, lepto-meningitis as a sequel of the infectious diseases, the meningitis of alcoholism, syphilis, sun-stroke, that resulting from the extension of middle-ear disease, and that from traumatism, does not properly fall within its scope.

The etiology of cerebro-spinal fever remains involved in obscurity. The recent discovery of a bacterium in the purulent exudation of the meninges (Fränkel, Foâ, Weichselbaum, Prudden), the morphological, biological, and pathogenic characters of which establish its identity with the Diplococcus pneumoniæ of Fränkel and Weichselbaum, is, as regards our knowledge of the pathology of the disease, a step in advance, but it in no way aids us in the matter of therapeutics. The treatment of this disease therefore still remains empirical and symptomatic.

Prophylaxis.

This, as all epidemic diseases, usually assumes its worst form and claims the greatest number of victims where antihygienic conditions most abound. At times of epidemic, prophylactic measures include the purification and disinfection of houses and localities and attention to personal hygiene. The thorough cleansing of streets and dwelling-places, close attention to the condition of the drainage and the proper disposition of the sewage, prompt removal of accumulations of refuse matter, and the avoidance of overcrowding are measures which should be at once instituted in the hope of diminishing the severity and mortality of the disease.

The evidence that the fever-poison in some instances spreads among the different members of a household, either from the individual first attacked or by way of his personal effects, or in consequence of some unknown favoring condition of the surroundings, renders it advisable that, where practicable, the dwellings in which the disease has made its appearance should be abandoned until after the close of the epidemic

(Ziemssen). It is recommended that all linen and other articles used by the patients should be carefully disinfected or burned.

The use of plain and wholesome food, the avoidance of unusual fatigue, both bodily and mental, and of excesses of every kind, are important. Moderate exercise, quiet, and regular living may afford some, but by no means complete, security during the epidemic.

Nervous persons and those in feeble health should, when possible, leave an infected district upon the outbreak of the disease.

Treatment.

No one who has carefully studied the records of this remarkable disease, or has had the opportunity of observing it upon an extensive scale, can fail to be impressed by the diversity of its manifestations. It has been well called a chameleon-like disease (Stillé). It cannot be a matter of surprise, then, that the treatment of the disease has been almost as various as its forms. In different epidemics and at different periods divergent and even opposite methods of treatment have been adopted. A vigorous supporting plan has been pursued by those to whom the disease has presented from the onset in an extreme degree the symptoms of depression ; again, the urgent symptoms of an intense inflammatory process localized in the membranes of the brain and spinal cord, and passing over to the subjacent nervous matter, have seemed to indicate the energetic use of depletory and other antiphlogistic remedies ; while the unsatisfactory results of both these plans, and our want of precise knowledge in regard to the etiology of the disease, have in other quarters led to the adoption of a modified expectant plan of treatment in which a careful regimen and efforts to combat the symptoms as they arise play the chief part.

Attempts to deduce from statistics conclusions in regard to the comparative value of different modes of treatment in an epidemic disease in which the mortality ranges between 30 and 75 per cent. must yield unsatisfactory if not fallacious results. It is not only impossible to compare the results of treatment in different epidemics, but, from the capricious nature of this affection and its various manifestations, it is even impossible to compare cases in the same epidemic, or, indeed, to compare the cases which occur during the rise, the maximum, or the decline of the same epidemic. We have to do with cases of this fever to which the term " average cases " may be aptly applied, as qualifying the intensity of the morbid phenomena and the rate of mortality which attends them, which yet differ among themselves by as many shades as there can be various combinations of the infectious or blood-element and the local inflammatory element which jointly underlie its manifestations. Cases are far from rare in which the attack is of the mildest form, only to be recognized by the lurid light of the outbreak in which

they occur—cases requiring no treatment, sometimes not even compelling the subject to take to his bed. In strong and terrible contrast to such cases are those in which, in the midst of health while at his ordinary occupation or on awaking from sleep, the patient is overwhelmed by the infection as by an avalanche, and, passing rapidly from agonizing suffering to coma, perishes in the course of a few hours. Here the brevity of the course and the nature of the lesions alike show the powerlessness of our efforts to control the attack. Medicine, with all its resources, is neither adequate to combat it nor responsible for its result. As Stillé has said, "The first symptoms of the disease are the first phenomena of death."

We are driven, then, in estimating the results of the treatment, to restrict our observations to the effect of remedies upon the individual patients, the immediate influence upon their symptoms, both subjective and objective, and the permanence of that influence.

A judicious treatment must be based upon the broad general principles of therapeutics.

The room should be darkened and all noises and other disturbing influences avoided. In view of the infectious character of the disease, its rapidly disintegrating effect upon the blood, the early and often alarming debility in some cases, the marked depression that in others follows the active symptoms, the great emaciation and the tedious convalescence, measures of depletion must be employed with the greatest caution, and are in most cases wholly contraindicated. In the young, and particularly in children, the abstraction of even small quantities of blood is liable to be followed by alarming symptoms of depression. Dr. J. Lewis Smith reports a case in which the application of a leech to each temple in a child aged four years was followed by extreme and almost fatal exhaustion. General bloodletting is in no case admissible. It is to be borne in mind that the pulse is almost always, even from the onset, such as would contraindicate the abstraction of blood, and if the urgency of the symptoms of the local inflammation and the critical state of the patient seem to call for the employment of energetic measures, the clinical history of the disease reminds the physician that a no less marked depression is speedily to follow and calls for a thoughtful regard for the future. Even in the sthenic cases cut cups to the nape of the neck and along the spine are to be employed with caution. Leeches may be applied to the temples and in the neighborhood of the mastoid processes. These measures are of great value in mitigating the headache and spinal pains which in many cases are symptoms of such terrible significance.

If such local abstractions of blood be contraindicated by the state of the patient, dry cupping may be employed with advantage.

The direct application of cold to the head and spine by means of ice,

snow, or a freezing mixture in rubber bags is not open to the same objections as bloodletting, and at the same time is often attended with satisfactory results as regards the symptoms of inflammation. If the bags cannot be procured, a bladder filled with cracked ice mixed with bran may be substituted. In children gentle cold affusions may be practised. The application of cold by these means is in most cases followed by very marked mitigation of the pains, and often by quietude or sleep. It should be continued as long as the patient derives comfort from it, and repeated upon the return of the symptoms. Patients frequently require the continuous application for hours at a time. A hot mustard foot-bath, or a general hot bath, 38°–39° C. (100.4°–102.2° F.), should be employed as early as possible, care being taken that the strength of the patient be in no wise taxed. This may be followed by gentle frictions with some stimulating liniment or with oil of turpentine if the surface be cold and the circulation depressed. A stimulating enema may at the same time be administered. The patient should also be covered with warmed blankets and artificial heat applied to his sides, thighs, and extremities. In all cases it is well, while using the cold to the head and spine, to counteract its depressing effect by the application of moderate heat elsewhere. This may be accomplished by means of hot flannels, bags of hot sand or salt, bottles filled with hot water, or heated billets of wood well wrapped up. At the same time, if necessary, sinapisms are to be applied to the extremities and the præcordium.

Bartholow holds that the application of ice to the head and spine may do mischief by the depression of the circulation which it causes. He advises, instead, the use of hot water applied by a sponge passed over the spine every two or three hours. The best modern American authorities agree in advising the continuous use of external heat, to anticipate and counteract the early depression which is so grave an element of the disease—a practice very general in the early epidemics in this country, but for a long time strangely overlooked here and altogether neglected abroad.

Blisters upon the occiput and upon the nape of the neck are not only to be advised upon theoretical grounds, but they are of great practical value in relieving pain and in diminishing delirium, spasm, and coma. They should be applied early in the course of the disease.

The use of mercury, except at the onset of the attack, in the form of a dose of calomel as a purgative, is to be discountenanced. No single drug has been employed to a greater extent than mercury in the treatment of cerebro-spinal fever, but almost all authorities at this time regard with disfavor the employment of the preparations of this metal for its supposed antiphlogistic or antiplastic effect or its absorbent effect upon the exudation. Among German writers, Ziemssen, however, rec-

ommends its use in the form of mercurial ointment or calomel "for the purpose of preventing the extension of the meningeal inflammation and exudation." He employs free inunctions and the internal use of calomel "in almost every case," but admits that when used in connection with other remedies it is difficult to ascertain its share in the common effect, and that even when used alone its efficacy is by no means clearly established.

The antipyretic treatment by cold baths and enormous doses of quinine, as practised by the Germans in diseases attended by pyrexia, can rarely be necessary, for the reason that in most cases the fever is moderate, and in those cases characterized by an excessively high temperature the fatal event is due to other causes than the fever. Quinine has no control over the intermittent variety of the disease. The use of quinine in large doses at the very beginning of the disease is favorably spoken of; but its administration in the later period, when the phenomena all point to intracranial exudation, is of no use, and liable to prove even hurtful except in small doses as a tonic to an enfeebled system.

The statement that this drug has appeared to abort the disease in some instances is not borne out by sufficient evidence. There is no abortive treatment.

Opium, by the concurrent testimony of all observers, holds the highest place in the treatment of this disease. It was used in America in the early part of the present century, adopted as a treatment in France at a later period, and has recently found favor in the eyes of the physicians of Germany. Ziemssen says of morphine that it "may be regarded as one of the most indispensable remedies in the treatment of epidemic meningitis."

All the distressing symptoms—the headache and spinal pains, restlessness, the spasm, the hyperæsthesia, and the inability to sleep—call for the administration of this drug. Our knowledge of the nature of the lesions also suggests its use. Opium slows the heart and increases arterial tension. It is to be employed at the earliest moment possible and in full doses. By this means we may anticipate the occurrence of exudation or limit it. Experience has shown that a remarkable tolerance for this drug exists in most cases of cerebro-spinal fever. Some of the older physicians gave large doses. Strong in one case "gave sixty drops of laudanum every hour till half a fluidounce was taken. The whole of it was retained, and it subdued the excitement and relieved the pain, but produced no sleepiness or other apparent effect of opium." Others among the early American writers gave enormous doses—$\frac{1}{2}$ ounce of the tincture or from 30 to 60 grains in substance in the course of twelve hours being necessary to control the urgent symptoms. Such cases recovered. Chauffard, to whom Hirsch erroneously

ascribes the first advocacy of the opium treatment, gave it in doses of from 3 to 15 grains. Boudin frequently gave 7 to 15 grains at a single dose at the commencement of the attack, and afterward 1 to 2 grains every half hour. As soon as the symptoms abated or the patient became drowsy the dose was diminished. Stillé gave 1 grain every hour in very severe cases, and every two hours in moderately severe cases, without narcotism or even an approach to that condition. He adds that "under the influence of the medicine the pain and spasm subsided, the skin grew warmer and the pulse fuller, and the entire condition of the patient more hopeful."

We are struck with the correspondence between these statements and those of the late Alonzo Clark and his followers in regard to the treatment of puerperal peritonitis by massive doses of opium. The remedy must be given for its effect, and the quantity necessary is to be prescribed. Its greatest usefulness is to be reached only by its admintration early in the course of the disease. After the symptoms indicative of effusion appear, it must be given in smaller doses and its utility is greatly diminished. It is among the most notable facts respecting the use of opium in this disease that the early American physicians did not hesitate to employ it when coma threatened—a condition usually thought to preclude the use of narcotics—and Strong and others have recorded their opinion that it is a powerful agent in removing such comas as are not "absolutely irrecoverable."

When the condition of the patient is such as to render its administration by the mouth impracticable, or when the repeated vomiting prevents its absorption, the opium may be given in the form of enemata or suppositories, or one of the morphine salts may be substituted in hypodermic injections. The latter is in most cases the best plan of treatment.

In view of the fact that children are peculiarly susceptible to the action of this drug, the dose must be regulated with caution. A boy aged six years, under the care of Dr. J. Lewis Smith, was quieted by the subcutaneous injection of $\frac{1}{32}$ of a grain of morphine sulphate.

Ergot and belladonna have been used upon theoretical grounds, on account of their influence in diminishing vascularity of the nervous centres, but the evidence of their value is not satisfactory. Rosenthal urges great caution in the administration of belladonna and in the hypodermic use of atropine.

Cannabis indica, the fluid extract of gelsemium (Bartholow), zinc oxide, large doses of chloral hydrate, and inhalations of chloroform have been employed in the management of the stage of excitement. Chloral is to be emphatically condemned in the treatment of a disease attended with vomiting so continued as often to interfere with the assimilation of food, and characterized by a tendency to extreme exhaustion; so also chloroform inhalations, when from the outset

we often have to do with a feeble and irregular action of the heart, showing itself in extreme weakness and irregularity of the pulse, and a tendency to syncope upon assuming the upright posture; of the others it may be said that they are useful auxiliaries to treatment, but that they do not in severe cases constitute an efficient medication.

The last remark holds true also of potassium bromide, a remedy which has, however, great value in the treatment of mild cases and in the treatment of children. It may be advantageously combined with opium or morphine.

In cases of extreme urgency the inhalation of Squibb's ether may be resorted to for the purpose of securing temporary relief from the torturing pain, the jactitation, and the spasm.

Veratrum viride and aconite have been used in the treatment of this disease in its early stages. The use of these drugs in sufficient doses to produce their physiological effects is based upon unwarrantable assumptions in regard to the nature of the disease, and is not justified by the results of experience. On the one hand, the inflammatory processes and the hyperæmia accompanying them are due to the direct local action of the infecting principle, not to any over-action of the forces of the circulation or increase of vascular tension. On the other hand, the speedy development of a high grade of cardiac asthenia with small, feeble, and irregular pulse, points conclusively to the depressing action of the infecting principle upon the circulation, and emphasizes the impropriety of the employment of depressant remedies at any period of the disease.

Of the employment of the new analgesics in the treatment of this affection the writer has had no experience. From what we know of their action there is little to be looked for in their exhibition in ordinary doses in the severe cases, and the use of large doses is attended with the danger of depression. In mild cases, however, and particularly in the lightest forms of the epidemic disease, the use of antipyrine, phenacetin, and exalgin will doubtless prove of service in mitigating the headache and holding in abeyance the neuralgic pains.

Upon the approach of depression excitants and stimulants are to be resorted to. Among the more useful are ammonium carbonate, spirit of chloroform, turpentine, and the preparations of alcohol. Cold affusion, practised several times a day, is recommended by German writers. It is a remedy scarcely likely to be widely used in this country. Quinine may be given in moderate doses.

Alcoholic stimulants are required at some time in the course of the majority of cases. Their use as a remedy in the treatment of this fever, independently of the indications which govern their use in the general management of diseases, has not been followed by satisfactory results. They are to be promptly employed when symptoms of depres-

sion of the nervous system show themselves, whether it be at the onset of the attack or later in the progress of the case. Their amount must be regulated by the effect which they produce. The pulse and the first sound of the heart are the best guides. If the pulse after the administration of alcohol becomes less frequent, stronger, and fuller, and the first sound more distinct, it is beneficial; but if the pulse increases in frequency, the heart's action being excited, the tongue grows dry, and the excitement augments, the alcohol must be given in smaller doses or abandoned. If the need be urgent and the patient unable to swallow, brandy should be given hypodermically.

During convalescence the vegetable tonics and iron are to be employed. Arsenic, and especially potassium arsenite, are also useful at this period. The latter has been praised as a remedy of value in the management of the acute disease. These praises are unfounded. Cod-liver oil is of use, and in proper cases potassium iodide is of proved service in promoting the absorption of the exudation. Its use should be long continued, and at the same time flying blisters in the occipital region, daily hot affusions, and, after all acute symptoms wholly cease, mild continuous galvanic currents, should be employed.

Potassium iodide is not of use in the treatment of cerebro-spinal fever during its acute course. Ziemssen states that he has not found it of the slightest benefit in the chronic hydrocephalus occurring as a sequel—a result which the nature of the lesions in that affection would lead us to expect.

A generous alimentation is to be given from the beginning of the sickness. During the continuance of the febrile phenomena milk, eggs, meat-juice, and broths should be given at regular intervals, and continued in severe cases during the night. If food cannot be taken by the mouth, an attempt should be made to administer nutritious enemata.

As soon as he is able the patient should be allowed an abundance of solid food. The appetite is often excellent, even in the early days of convalescence.

When there is thirst the desire for water must be freely gratified. This symptom is often very distressing.

Constipation may be relieved by a dose of calomel with or without jalap, by other simple drugs, or by enemata. Neither constipation nor diarrhœa is, as a rule, difficult to relieve.

When there is much prostration, and, indeed, in most cases, the patient should be guarded against assuming the erect posture, or, in truth, against even sitting upright in bed, on account of the danger of syncope.

Delirium, spasm, and irritability of the stomach too often in the severe cases render the administration of medicine and food impracticable.

DISEASES OF THE NASAL CHAMBERS.

By RALPH W. SEISS, M. D.

The prevention of recurrent attacks of acute coryza is one of the most important problems of treatment in nasal diseases, and calls for careful consideration. The means to be employed will vary with the underlying causative factors, which in the great majority of instances are either vaso-motor disturbances, the gouty diathesis, or generally defective nutrition. Each of these conditions, when present, calls for the treatment, hygienic or otherwise, which may seem best suited to the particular case.

More general measures may be discussed under the headings of Exercise, Bathing, Clothing, and Local Prophylaxis. Vigorous but properly-directed "training" is an exceedingly valuable means of controlling the "catarrhal tendency," and in fairly healthy young subjects should always be advised. Horseback riding is probably the best exercise in most cases; walking and running rank next; "wheeling" uses too limited a set of muscles, but is admirable, if combined with indoor exercises, for the arms, back, and chest. Light gymnastics may be ordered for patients not sufficiently vigorous to take the heavier forms of exercise. It has frequently been a surprise to the present writer to note the rapid improvement in catarrhal cases where "training" suited to the strength of the individual has been ordered, even after local treatment had failed to give satisfactory results.

Regular and frequent bathing, combined with daily cold sponging of the face, neck, and chest, is decidedly beneficial in preventing "colds," but in cases in which the vaso-motor system is much below par considerable caution is necessary. Cold plunge-baths are frequently the reverse of useful in weak and catarrhal subjects, and should be prohibited, at least during the winter months. Energetic friction, either with a plain rough or "salted" towel, must always follow the bath, and should be continued until the skin is decidedly reddened. More elaborate methods of using water as a vaso-motor tonic will be found described in Volume I. of this work.

Patients with strongly-marked catarrhal tendencies should wear woollen under-clothing of sufficient weight at *all* seasons, garments of at least *three* degrees of thickness being required: the heavier

weights should be put on with every marked fall of temperature, whatever the season. Under-clothing which has become damp from perspiration should be changed as soon as possible, even though this may necessitate dressing several times during the day. The wearing of warm woollens at night is a point much neglected, but of great importance; in no case, however, should the clothing worn during the day be retained. Woollen stockings should be worn during the winter months, and stout-soled shoes in all weathers, with the addition of rubber overshoes on wet days. Waterproof leather shoes are something the writer has never been able to find, and damp feet are always a serious menace to persons of catarrhal tendency.

In considering the local prophylaxis of nasal inflammation the etiological factors which act directly on the Schneiderian membrane should be remembered. Bad air of all sorts acts as a direct irritant to the mucous membrane of the nasal cavities; air laden with particles of wool or minute fragments of some hard substance, such as coal, stone, or steel, is the worst of all; but all inhaled solid matters are injurious. Gases are less directly hurtful, and act more through the lungs and general circulation than directly on the nose; but many, especially derivatives of sulphur, are capable of producing severe nasal inflammation.

Patients whose occupations compel them to breathe an irritating atmosphere should wear a respirator or a flat, dampened sponge over the mouth and nostrils while exposed to it. The occasional use of some mild alkaline spray also serves to control the injurious effects of dust-laden air; probably there is no better fluid for the purpose than Dobell's solution, the formula of which is appended:

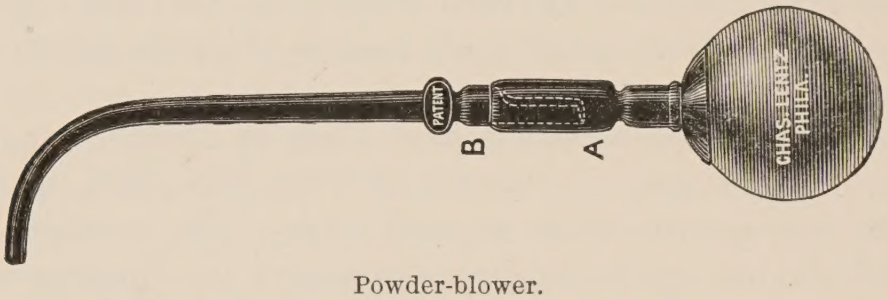
℞. Sodii boratis (C. P.),
Sodii bicarbonatis, " āā. gr. viij;
Acidi carbolici, " gr. iv;
Glycerini, fʒij;
Aquæ destillatæ, q. s. ad fʒiv.—M.
Sig. Use in atomizer.

Modern nasal therapeutics includes the use of remedies in solution as sprays or pigments, or their application in the form of powders by means of various insufflators; also the use of chromic acid and other caustics, electricity in the form of both constant and interrupted currents, and the galvano-cautery. Special surgical procedures are also required in a large number of cases, for the performance of which various forms of snares, curettes, forceps, and knives have been devised. All methods of local treatment require for their proper application the head reflector and the nasal dilator, as well as a bril-

liant and controllable light: an argand gas-burner and the "Rochester" lamp are both to be recommended for this purpose. The greater number of remedies used in the nasal chambers are best applied as sprays by means of an atomizer: a vast number of these instruments are now in the market, but by no means all are satisfactory when in use; the writer commonly employs the "Perfect," "Burgess," or "Llewellyn" models for all aqueous fluids. For solutions in oil a number of special forms have been devised by different manufacturers, the choice of which is largely a matter of individual taste: the "Magic," No. 1, is probably unexcelled for this purpose, at least for office use. Pigments are best applied on cotton brushes, made by wrapping the roughened end of suitable applicators with absorbent cotton, any desirable shape or size being given to the mop. Instruments for this purpose can scarcely be too delicate, the generality of nasal probes being unnecessarily large and heavy.

Insufflations of drugs in powder are not used by the writer, solutions in oil having superseded them in his practice: their use is, however, highly lauded by many rhinologists. The instrument figured above is the form usually employed: the remedies must be in the finest possible powder; if *bolted* their irritant effect will be much lessened. The formulas which have been found most useful in nasal disease, and the special surgical procedures indicated, will be described in detail under the various types of inflammation.

FIG. 5.



Powder-blower.

ACUTE CORYZA.

THE abortive treatment of an ordinary "cold in the head" is successful in many cases. The technique, which must be carried out in the early stages of the disease, consists in first thoroughly cocainizing the nasal mucous membrane, from 3 to 5 drops of a 5 per cent. solution being injected into each nostril by means of an ordinary medicine-dropper. After complete contraction has taken place, which usually results within five minutes, the nasal chambers are to be gently

but thoroughly sprayed with some mildly antiseptic solution, of which the following is perhaps the best:

℞. Listerine (Lambert), fʒiv;
Acidi borici, gr. xx;
Aquæ rosæ, fʒiv.—M.
Sig. Use in atomizer.

Complete nasal respiration being established and all mucus washed from the nasal cavities, the membrane may be coated with a carefully *bolted* powder composed of sulphate of morphine, with atropine in minute quantities, in combination with subcarbonate of bismuth and powdered acacia. The remedy is to be applied by means of the laryngeal powder-blower, under full inspection by means of the forehead mirror and nasal speculum. Much better than the foregoing are sprays of liquid *albolene*, containing eucalyptol, menthol, camphor, etc., the surface of the membrane being thoroughly coated with the oil after cleansing by means of the watery solution. The appended recipe is much used by the writer:

℞. Menthol., gr. iij;
Camphor., gr. v;
Albolene (liquid), fʒj.—M.
Sig. Use in atomizer.

Internally, a small dose, $\frac{1}{12}$ to $\frac{1}{8}$ grain, of morphine, given at bedtime, together with a hot whiskey-lemonade, will complete the cure in the case of many patients. Full doses of quinine act well as abortives in occasional instances, but in others seem rather to increase the nasal congestion, and are at all times a serious menace to the ears, which may be already in a state of irritation from congestion of the lining of the Eustachian tubes.

In cases in which the patient has not applied for treatment until the acute coryza has fully developed the foregoing method may be followed, but cocaine should be omitted; as, after infiltration has progressed, it serves only to lower the tone of the membrane and often to prolong the disease. Rather large doses—15 grains three or four times a day—of sodium bromide may now be given; and they seem greatly to shorten the duration of the attack, and certainly add to the comfort of the patient. In severe cases, in which the larynx and bronchial tubes have participated in the inflammatory condition, tonic and stimulating remedies are usually indicated late in the course of the affection; strychnine and a reliable wine of coca are favorites with the writer.

In children much of the above treatment must be necessarily

omitted, but the solutions can be used in nearly every instance if a well-shaped medicine-dropper be substituted for the atomizer. The *vapor* of menthol acts very well if properly used: the crystals should be added, *one by one*, to a cup of boiling water held near the child's nose, and the little patient encouraged to breathe the fumes. If the menthol be added too rapidly, the vapor becomes very irritating and disagreeable, much distress and harm resulting. The child must of course be most carefully protected from draughts or temperature-changes, and all possible complications watched for. An ointment composed of 1 part pure lanolin to 2 of solid albolene, liberally applied over the nose externally, seems to have a comforting and beneficial effect. Bromides act even more favorably in children than in adults, and should be given in corresponding dose; the syrup of lettuce makes an admirable vehicle, and has itself a distinctly quieting effect.

IDIOSYNCRATIC CORYZA.

Synonyms.—Hay fever, Rose cold, Autumnal catarrh.

As this condition is certainly increasing in frequency in this country, its successful treatment has become a matter of very great importance. In about one-half the cases the disease can be so perfectly controlled that it might be considered cured; the majority of the incurable cases can be greatly relieved, but a certain proportion of patients seem only to be made worse by every therapeutic means tried. The latter class is, fortunately, a small one, and for these nothing remains but a residence in some locality which is exempt from the affection, such as the White Mountains, Fire Island, L. I., and numerous resorts in the North and West, during the period of attack.

The therapeutic management of hay fever is divisible into that proper for the attack and the methods which may be used during the interval to prevent recurrence of the disease.

The knowledge that a sufficiently strong solution of a salt of cocaine will perfectly relieve an attack of idiosyncratic coryza *for a short time* has been a baneful lesson to many sufferers. The alkaloid has not the slightest curative power, but decidedly the reverse, and its constant use in *strong solution* is invariably followed by constitutional poisoning and serious results. Properly used, however, as an adjuvant to more radical measures and to tide a patient over sudden paroxysms of irritation, it is a most valuable agent in this disease. The solution used should never exceed 10 per cent. in strength, and 5 per cent. is sufficient for the majority of cases, and the applications must not be made oftener

than two or three times in the twenty-four hours. To apply the solution the patient should bend the head backward and inject a few drops of the solution into the nasal chamber; frequently only one side will require anæsthetizing to secure relief. Next in value in the paroxysmal stage of hay cold is menthol, which may be used as an inhalent or dissolved in albolene oil. A satisfactory inhaler may be made in a few minutes by smoothing off one end of a glass tube, which should be about four inches long and of a diameter to fill the nostril. A light tuft of cotton is placed in the middle of the tube, some crystals of menthol dropped upon it, and a second tuft of cotton placed over the medicament: one extremity of the tube being fitted in the nostril, the heat of the hand serves to vaporize the menthol, which is to be breathed into the nasal chamber. If used as a solution, the strength should not exceed 6 grains to the ounce; 3 grains, combined with camphor, as advised in acute coryza, will usually be found more grateful to the patient. Cubeb cigarettes give great comfort to a few cases, the smoke being allowed to escape from the mouth through the nostrils; from three to five may be smoked per *diem*. During the height of the attack aqueous sprays seem very often to act as irritants, and if used at all must be chosen with great care and applied with the utmost gentleness. Spray inhalations by the *mouth*, on the other hand, often act admirably in allaying irritation of the lower respiratory tract. Minor points, such as the wearing of blue glasses when the eyes are much irritated, or of some form of respirator if much dust is to be encountered, are always worthy of attention, and the mode of life must be as hygienic as possible. In no case should any active treatment be attempted during the paroxysmal stage, and all irritative therapeutics, especially the use of any powders in the nasal chambers, are, in the writer's opinion, most decidedly contraindicated.

Of internal remedies valuable in the acute stage of idiosyncratic coryza, morphine is the most reliable, and but for its depressing constitutional effects it would be a most useful agent in this affection. From $\frac{1}{16}$ to $\frac{1}{12}$ grain of morphine sulphate may be given twice or oftener *per diem*, and it will assure comfort in most instances.[1] But the effect of the alkaloid on the general health is so disastrous that it can be tolerated only when given at considerable intervals. Atropine may be given alone or combined with morphine, but is much less useful and far more dangerous than the latter alkaloid: quinine and sodium bromide are useful when the general circulation is much disturbed, and excellent results from the use of antipyrine have been reported.[2]

In the interval between the annual attacks a hay-fever patient

[1] See S. N. Bishop, *Journ. Amer. Med. Association*, 1887.

[2] For use of antipyrine, etc., see A. Bloch, *Med. Register*, 1887.

should undergo a most careful naso-laryngeal examination, and all local causes of irritation should be removed. If hypertrophy or any form of chronic rhinitis be present, it must be cured, any serious obstructions to respiration, whether ecchondroses, bony enlargements, or polypi, must be removed, and all hyperæsthetic areas should be cautiously cauterized. The localization and destruction of these sensitive centres comprise the successful treatment of the disease: they should be thoroughly looked for by careful probing under full illumination, and when found are to be lightly incised with the galvano-cautery needle. If every area of abnormal sensibility can be found, and the nerve-endings destroyed, there will usually be no return of the paroxysms. The matter may be easily overdone, however, and a patient with nasal sclerosis, the result of reckless galvano-cauterization, is in a far worse condition than are most sufferers from hay fever. Chromic acid may be substituted for the electric knife, but is less efficacious and much less controllable. Prolonged treatment with tonic and mildly-astringent sprays is always indicated; the distilled extract of hamamelis, diluted with an equal amount of rose-water, is one of the most useful solutions for the purpose. Constitutionally, tonics are very often required, and a large supply of fresh air and regular exercise, combined with long hours of perfect rest, are needed in nearly every case of hay fever, "neurasthenia" and vaso-motor-disturbances being the rule in this disease.

It should be remembered that cases of "false hay cold," or vaso-motor coryza, are far from rare, the victims undergoing the characteristic torments of the disease at any and every season, and from even such remote exciting causes as mental impressions. These patients are always neurotics, and need the treatment proper for such cases: local therapeutic measures should be the same as for the typical form of the disease. Asthma, neuralgia, and other reflex neuroses are also occasionally dependent on nasal disease: their proper treatment consists in localizing and curing the local lesion.

SIMPLE CHRONIC RHINITIS.

Persistent inflammation of the nasal mucous membrane, unaccompanied by hypertrophic changes, is not very frequently seen by the rhinologist, but, as such cases do report for treatment, and as this is undoubtedly the first stage of the hypertrophic process, its successful management is of considerable importance. In this condition properly chosen and skilfully applied sprays have almost a specific effect, and

will arrest the disease and secure perfect comfort for the patient in the great majority of instances.

The appended formulas are among the most useful:

℞. Listerine (Lambert), ʒiv;
Sodii bicarbonatis,
Sodii boratis, *āā.* gr. viij;
Aquæ rosæ, q. s. ad fʒiv.—M.
Sig. Use in atomizer.

℞. Zinci sulphocarbol., gr. x;
Acidi carbolici, gr. iv;
Aquæ destillatæ, fʒiv.—M.

Solutions of hamamelis, as suggested in hay fever, and of the iodide of zinc, also act very well in certain cases; resorcin is highly recommended by Sajous in the strength of 5 grains to 1 ounce of water. The pharynx and larynx require attention quite as much as the intranasal region, as a rule, and all sources of irritation, constitutional or local, are, if possible, to be removed. It should be remembered that stubborn attacks of rhinitis are one of the phenomena of gout, and in such cases require the constitutional treatment proper for that disease. The conjunctivæ are usually implicated in this condition, and recurring attacks of inflammation both of the eyes and the nasal mucous membrane are characteristic of gouty rhinitis. All forms of irritating dust and foreign materials generally in the air produce rhinitis, and must be excluded if improvement is to be secured. Minute fragments of wool and of carbon, and the alkali dust of certain areas in the West, are especially apt to produce intractable catarrh.

Uncomplicated cases of rhinitis simplex usually run a perfectly favorable course under treatment, and can generally be dismissed after three or four weeks. Left to run its course, hypertrophies soon form, and secondary lesions in the pharynx, larynx, and Eustachian tubes more or less speedily occur. It is therefore of the first importance to begin therapeutic measures in the earliest stages of nasal inflammation, before organic changes have occurred; and undoubtedly the great majority of cases of aural catarrh, chronic laryngitis, and similar sequelæ could thus be prevented.

CHRONIC HYPERTROPHIC RHINITIS.

This, in our Atlantic climate, is the commonest form of nasal disease, and is found in some one of its stages in perhaps one-third of our adult population. It is the most prominent cause of deafness, throat and bronchial disease, and of numerous obscure conditions of the eyes

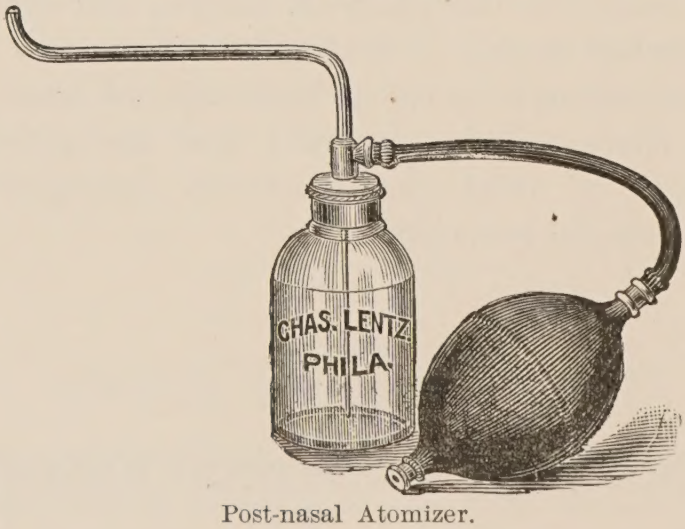
and cerebral circulation. Its therapeutic management is therefore deserving of the closest study. In its early stages the treatment of hypertrophic catarrh does not differ essentially from that advocated for simple rhinitis: the same sprays can be used, but the applications may need to be continued for some months and the solutions slightly increased in strength. Light pencillings with iodine also act well in this type of the disease: the following formula is of a standard strength which may be diluted if necessary:

℞.	Iodini (cryst.),	gr. x;
	Potassii iodidi,	gr. xl;
	Glycerini,	f℥j.—M.
Sig.	Use on cotton brush.	

The technique of such applications is of the first importance. If the solution be simply brushed carelessly over the entire mucous membrane, much unnecessary irritation is caused, and the remedy may be harmful rather than beneficial in its results. The cotton carrier should be a light steel one, such as is used by aurists, and the cotton mop must not exceed three or four millimetres in diameter. The pledget, being saturated with the medicament, is to be lightly passed backward along the lower turbinated body until the posterior pharyngeal wall is reached, care being taken not to rub the iodine over the floor of the nasal chamber or the septum.

When the nasal secretion is thick and glairy, and can be removed by the patient only by means of violent hawking and blowing, the curved post-nasal atomizer is essential to a thorough cleansing of the

Fig. 6.

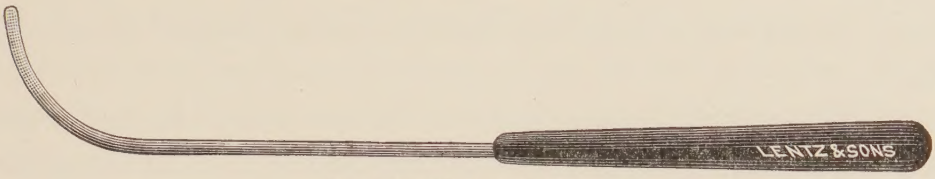


Post-nasal Atomizer.

nasal chambers. Dobell's solution or one of the formulas previously given may be used. The nozzle of the instrument being introduced through the mouth and well up behind the palate, the post-nasal space

is to be thoroughly washed out, the atomizer being removed and reintroduced from two to four times until the nose is perfectly cleared. In cases in which the pharyngeal tonsil is irritated and inflamed, as

FIG. 7.



Post-nasal Applicator.

shown by the rhinoscopic mirror, post-nasal applications of glycerite of tannic acid, 40 grains to the ounce, or of iodine in glycerin, made by means of the curved applicator through the mouth, are of much value.

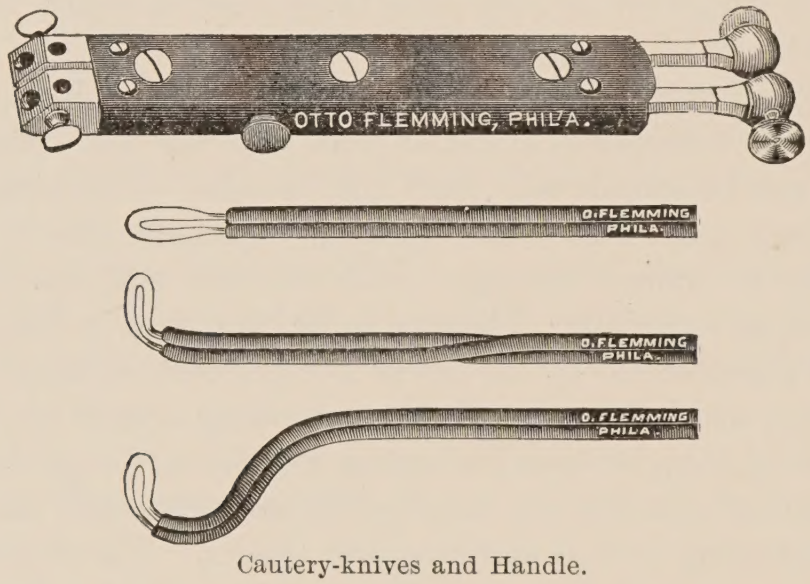
The head-mirror and tongue-depressor are always necessary in carrying out any treatment in the region of the posterior nares, and the utmost care and gentleness is essential, the parts being most intolerant of injury. Medical therapeutics directed to the pharynx and region of the tonsils are of very great importance in nearly all cases of nasal catarrh.

The surgical management of hypertrophic rhinitis is too extensive a subject to be considered in detail here, and the more general principles only can be considered. Soft and vascular enlargements, which do not contract sufficiently under medical treatment, may be perfectly cured by one or more "tackings" with chromic acid, used according to the following technique: The area to be cauterized is first fully contracted and anæsthetized by the use of a 5 per cent. solution of cocaine hydrochlorate, which is best applied by saturating a small pledget of cotton and tucking it up between the septum and the surface of the turbinal. From five to ten minutes are required to secure the full effects of the drug in contracting and benumbing the tissues. The chromic acid is to be used on a very delicate but firm cotton-carrier in the form of a fused bead, or a few crystals can be made to adhere to a small and tightly-wound cotton tuft by slightly dampening it with water. The latter method is the simplest and safest, as the fused acid deliquesces very rapidly, and is apt to spread unpleasantly when used in the nose. The charged portion should not exceed two millimetres in diameter if the moist acid be used, and the dry bead must not be larger than the head of an ordinary pin. The moistened applicator having been prepared, the cocaine pledget is removed and the acid carried under full inspection to the point of greatest hypertrophy, and held firmly in contact with the mucous membrane for at least twenty seconds. Great condensation of the turbinated tissue at the point of contact results, together with a slough of varying but always shallow depth, the

ultimate and speedy effect being to bind down firmly and permanently the redundant tissue. Immediately after using the acid the nares should be sprayed with some alkaline solution to prevent its spreading: Dobell's solution answers the purpose admirably. The cauterizations may be repeated at intervals of ten or twelve days until physiological respiration is secured, sedative sprays being employed during the interval.

Where fibro-blastic changes have taken place in turbinated hypertrophies, rendering them less vascular and denser in structure, more energetic means are required to reduce them. It should not be forgotten that contraction has already commenced in these enlargements, and that if operative measures be in the least overdone sclerosis and atrophy, most pernicious to the patient, will result. Where respiration is embarrassed or the normal functions of the nose otherwise interfered with by fibrous overgrowths, their removal by the galvano-cautery is indicated. Knives of various shapes are required for different uses, the most generally useful being the flat blade figured below.

Fig. 8.



Cautery-knives and Handle.

There is a variety of cautery-batteries in the market, the merits of which are about equal; several forms of storage batteries are at present most popular.

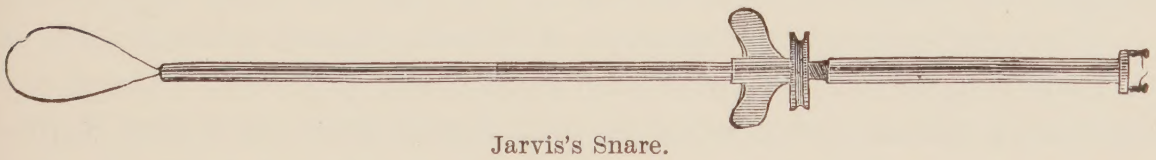
To remove a fibrous hypertrophy the turbinal is thoroughly cocainized, as for the application of chromic acid; the cautery-knife is then introduced through a suitable speculum under perfect illumination and inspection, and a shallow slit burned in the turbinated tissue. The knife must be introduced cold, and heated to a bright red when in contact with the mucous membrane by closing the circuit, when it is drawn forward, making an incision of the required length. Unless the operator is an expert and the patient perfectly controllable, it is safer to protect the septum by means of a small piece of bristol board cut to

fit and introduced before the cauterization. A thread passed through the card and allowed to hang from the nostril assures its easy removal, which may otherwise prove to be surprisingly difficult. As a rule, there is no subsequent pain, hæmorrhage, or inflammatory reaction: if the first occurs, it is usually because either the periosteum or the septum has been burned. If slight bleeding should occur, it is easily controlled by holding a small piece of ice to the nose and keeping the head in an upright position. If for any reason the hæmorrhage should be considerable, the naris should be carefully plugged with a strip of gauze or patent lint, which in extreme cases may be dusted with tannic acid or dipped in a strong solution of the same. The immediate cause of bleeding is always the removal of the eschar, either by its being dragged off by the cautery-blade, owing to the latter being allowed to cool while in contact with the burned surface, or from some other cause. The patient should always be cautioned against forcibly blowing the nose or indulging in any form of violent exercise for at least twenty-four hours after the operation.

From one to four cautery incisions may be required to remove the occluding mass, at least two weeks being allowed to elapse between the burnings. During the interval the patient should be seen every third or fourth day and the nose treated as directed for acute coryza in its latter stages. Any inflammatory reaction or sepsis is thus prevented in most cases, and the burn heals much more rapidly than if left to run its course without further treatment.

Very large anterior hypertrophies and all posterior growths requiring operative treatment are best removed by the Jarvis snare, which is, after the cautery-blade, the most valuable instrument used in nasal surgery. Its successful use, however, demands a large amount of skill

FIG. 9.



Jarvis's Snare.

and special experience. Growths in the anterior nasal region require a full half hour for satisfactory removal, otherwise very annoying hæmorrhage is almost certain to result, while in the case of posterior hypertrophies an entire hour is required to secure a bloodless operation. The technique of snare-manipulation varies with every case, the only general rule being the very simple one that the growth is to be engaged in the wire loop, which is then to be tightened by turning the milled nut. After a firm grasp is once secured, the nut should be turned once every three to ten minutes until the mass is cut through.

Posterior new-growths can be grasped only by the aid of the rhino-

scope, the mirror being held in the left hand while the snare is manipulated through the nose by the right. There are many difficulties in the way of a successful performance of this little operation, which the space at my disposal does not permit me to describe here, and it is the writer's opinion that it should be attempted by a novice only when under the immediate direction of a skilled operator.

Myxomatous tissue, the result of degeneration of turbinated hypertrophies, frequently calls for removal in cases of chronic rhinitis. The masses may be ablated by means of the Jarvis snare, or if high up in the nasal chamber some form of biting forceps may be required. The writer's or some similar instrument may be used, small pieces being gnawed off until all myxomatous tissue is removed.

Nasal polypi (adenomata) are occasionally found in advanced cases of hypertrophic catarrh, and should be removed with the snare, the base being subsequently seared with the galvano-cautery blade to prevent recurrence. If attached far up in the nasal fossa, forceps may be required for their removal, which must always be done under full inspection, the older methods, of wrenching out polyps with the forceps, guided only by the sense of touch, being at the present day wholly inadmissible.

Deviations and ecchondroses of the nasal septum and bony outgrowths from the vomer and turbinals occur as complications in a certain proportion of cases. If they do not seriously interfere with respiration or cause unpleasant symptoms from their pressure on surrounding parts, they demand no especial treatment; but if the breathing passage is much obstructed, operative interference is necessary. The septum knife, nasal saw, dental engine, gouge, or chisel may be required, each case demanding a technique peculiar to itself. In the opinion of the writer these operations are far from being free from danger, and should only be undertaken by experienced nasal surgeons.

The constitutional management of chronic hypertrophic rhinitis is of more importance and value than is generally supposed. The gouty diathesis is the causative factor in quite a number of cases seen in private practice, and of course demands the appropriate treatment for that condition.[1] Anæmia and "neurasthenia" seem to be concomitants of nearly all severe cases of the disease, and call for therapeutic management; indeed, their removal is essential to a cure of the local lesions. Drugs which are supposed to act directly upon the nasal mucous membrane when taken internally have not given very satisfactory results in the writer's hands. Cubebs, grindelia robusta, crude petroleum, etc., while most efficient agents for impairing the digestion, give slight if any other results. Sodium bromide and ammonium chloride are, however, useful in many cases, and add considerably to the good results of

[1] See article on Gout, Volume I.

treatment; strychnine also acts well by improving the general circulation. Tonics, fresh air, regulation of diet, and hygienic surroundings are of course important, and properly-directed exercise, carried in vigorous young subjects to active sweating, has a most distinct value in all cases of chronic rhinitis.

INFLAMMATION OF THE PHARYNGEAL TONSIL.

THIS, with its various secondary results, is so important a complication of all forms of rhinitis that its consideration calls for a separate section.

Few symptoms are so bitterly complained of by patients as the exudation of very tenacious mucus, which occurs from inflammation of the pharyngeal tonsil during the course of a "heavy cold." The discomfort may be speedily relieved by spraying out the post-nasal space by means of the upcurved atomizer with some sedative and alkaline solution, either of the formulas suggested for simple rhinitis answering the purpose. The mucous membrane being thoroughly cleansed, it may be lightly brushed with a 40-grain solution of tannic acid in pure glycerin by means of the post-nasal applicator. The application is not altogether painless, and requires a considerable degree of manual dexterity; the utmost care must be taken not to bruise or otherwise injure the parts. Should the palate close spasmodically upon the instrument, the latter must not be forcibly removed, but the patient instructed to make some vocal sound, when the palate will relax and the cotton-carrier can be slipped out without difficulty.

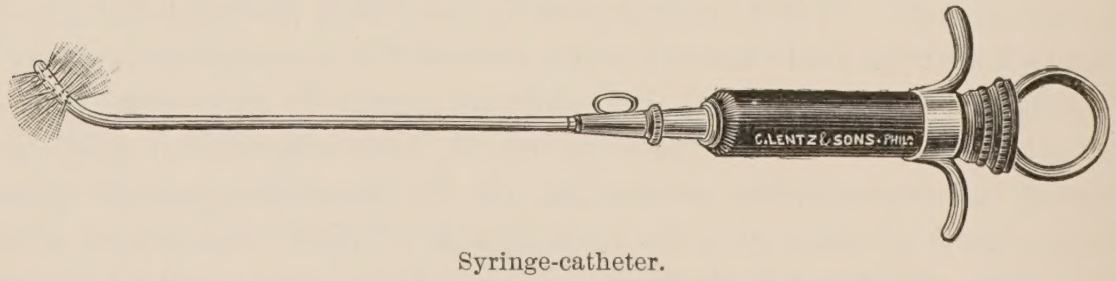
In almost all cases of hypertrophic catarrh the pharyngeal tonsil is chronically inflamed, and often enlarged. The treatment of simple inflammation of the gland has been already suggested when considering that disease. When enlargement has occurred, the applications of iodine should be made several times a week for a considerable period of time, and the strength of the solutions gradually increased. Good results may be obtained without operative interference even when the adenoid tissue somewhat encroaches on the nasal respiratory space. The tendency of these growths to disappear of their own accord must always be remembered in deciding on any radical means. Great hypertrophy of the pharyngeal tonsil, seriously interfering with the functions of the nose, may call for the use of the galvano-cautery knife, the wire snare, or some form of cutting forceps or curette. The writer regards the use of the finger in the post-nasal space, especially if the finger be armed with a cutting guard—as is suggested by several authors[1]—as

[1] See Lennox Browne, *Diseases of the Throat*, 2d ed. p. 519.

an exceedingly heroic procedure of doubtful utility. Very moderate curetting, or the biting or burning off of a few of the most prominent nodules of the tonsil, combined with the use of iodine, *and proper treatment of the whole naso-pharyngeal tract*, is sufficient in the great majority of cases. The instrument usually employed by the present contributor is a simple straight curette four and a half inches long from edge to handle, the ring well bent on the shaft and measuring five by ten millimetres. This instrument is easily introduced through the nose, is painless and safe in careful hands under cocaine anæsthesia, and will be found sufficient in all but a very few cases, in which grosser methods may be required.[1] In the case of adults the curette is guided by the aid of the post-nasal mirror, but in children the sense of touch alone must usually be relied upon. The sensations communicated to the hand through the instrument are sufficient in most cases: if absolutely necessary, the finger may be cautiously introduced behind the palate and the curette manipulated under its guidance. General anæsthesia is absolutely necessary in the latter instance, and the operation becomes a somewhat complicated and bloody one.

Very advanced stages of hypertrophic rhinitis are apt to be accompanied by atrophic and degenerative changes in the pharyngeal tonsil, resulting in crust formation in the post-nasal space, or a thick mucopus may trickle down the pharyngeal wall, both giving very great discomfort to the patient. The prognosis of this condition is very unfavorable, no form of treatment giving permanent relief; but if patients can be seen at intervals of a few weeks, palliative measures can be carried out which will secure almost perfect relief from the annoying symptoms. The post-nasal atomizer is here again of great value, and any of the solutions which will be given in the section on Sclerotic Rhinitis may be used with good result. The writer's syringe-catheter, figured below, serves a useful purpose in dislodging crusts and mucus too adherent to

Fig. 10.



Syringe-catheter.

be removed by the atomizer. It is introduced through the nose in the same manner as the ordinary Eustachian catheter, and when the posterior pharyngeal wall is reached is rotated inward and upward toward the vault: being fixed with the left hand, any chosen solution can be injected through the instrument by means of the syringe. The fine

[1] See *Transactions American Laryngological Association*, for 1889, p. 44.

jets of fluid remove masses which cannot be dislodged by any spray, and have none of the disagreeable or dangerous features of the ordinary large post-nasal syringe. The treatment must be repeated as often as the symptoms return, which is in most cases after a more considerable interval subsequent to each application.

Advanced atrophic, and sometimes ulcerative, changes occur about the region of the pharyngeal tonsil in rhinitis cirrhotica, and often cause most distressing symptoms. With our present knowledge the treatment of such conditions is exceedingly unsatisfactory, the best that can be done being to relieve the symptoms by careful antiseptic cleansing at intervals of a few days. Any of the sprays which will be given in the next section may be used, and one of the milder formulas may be given the patient to employ at home.

In all cases of disease of the pharyngeal tonsil the inflammatory condition will improve only with the general mucous membrane, and treatment of the whole upper respiratory tract is essential in nearly every instance.

SCLEROTIC RHINITIS.

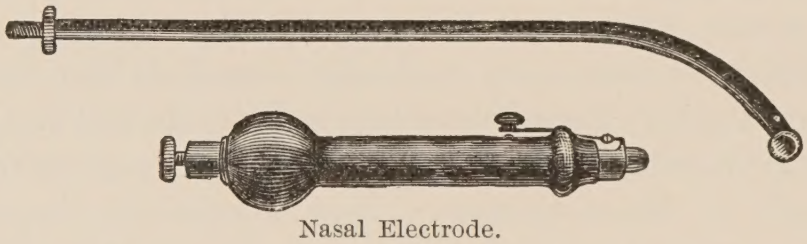
Synonyms.—Atrophic catarrh, Ozæna, Rhinitis cirrhotica, Dry catarrh.

The final stages of chronic nasal inflammation, when most of the intranasal tissues have been destroyed by fibrous changes and fatty degeneration, have been very variously classified; but, as all forms overlap considerably, their therapeutic management is best considered under a single heading. In all types of either sclerosis or true atrophy the prognosis is *discouragement.* New compounds frequently give relief for a certain time, and hence each of many drugs has in turn been lauded as a valuable remedy in this disease, only to be subsequently abandoned. Cases of simple sclerosis, even when far advanced, can be much relieved in very many instances, but when the epithelium is permanently lost palliation is all that the modern rhinologist has to offer the unfortunate patient. The former class of cases may be much benefited by the use of "alteratives" in the form of spray: the sulpho-carbolate and the iodide of zinc, solutions of thymol or of listerine, and Boulton's solution have proved most valuable in my hands. They must be applied with skilful and thorough technique, at first daily, and toward the end of the four, ten, or fourteen months of treatment once a fortnight. More energetic stimulants are frequently called for: tincture of myrrh, sanguinaria, or galanga diluted with glycerin to suit the

individual case, are perhaps the most satisfactory. Noquet[1] recommends chloride of zinc as a most efficient stimulant. The writer prefers to use them on a small cotton mop, lightly brushing the turbinated tissues with the medicine, the use of the head-mirror and nasal dilator being essential. Mechanical stimulation by means of cautious curetting of the papillomatous turbinated mucous membrane, especially of the post-nasal region, is of undoubted value in selected cases. The straight curette used by the writer for the treatment of enlargements of the pharyngeal tonsil is the best instrument for the purpose; it must be used with the utmost care, only the diseased epithelium being scraped off.

The faradic current is probably the most useful agent we possess for treating cases of all grades of sclerosis and atrophy. A straight nasal electrode, long enough to reach the pharyngeal wall when introduced through the nose, is necessary: its tip should be well wrapped with cotton and dipped in some alkaline solution. The positive pole is to be placed in contact with the nasal mucous membrane, the negative—an ordinary sponge or metallic rheophore—being held in the hand of the patient or applied to the maxillary or laryngeal region externally. To use the battery successfully demands much care and judgment, each case being largely a rule unto itself: the only general direction possible is that the current must never be so strong as to tire or irritate the patient. The séances should not at first exceed a few minutes in length, and ten minutes is the outside limit to which the applications should be carried.

Fig. 11.



Nasal Electrode.

Operative surgical treatment is very rarely called for in nasal sclerosis. The middle turbinated body may be so enlarged as to press upon surrounding structures, in which case destruction of the superabundant tissue is indicated, chromic acid, the galvano-cautery, or the Jarvis snare being employed. Care should be taken to remove no more than is absolutely necessary to relieve pressure, the tendency of this disease progressively to destroy turbinated tissue being never lost sight of. Myxomatous changes in the middle scroll may demand the use of the biting forceps, the masses being often too sessile and elastic to be grasped by the snare; the cautery-needle is not well suited for this purpose, too much cicatricial contraction resulting from its use. The

[1] *Revue mens. de Laryng.*, 1887.

operative procedures on the nasal septum described under Hypertrophic Rhinitis may be necessary in some, but certainly in very few cases, the main efforts of treatment in this disease being to conserve, not destroy, tissue.

Where extensive atrophic changes have occurred and the ciliated epithelium has been lost, palliative measures must be carried out at short intervals to be of benefit to the patient. Any of the milder antiseptic and stimulating formulas given previously may be prescribed for daily use at home, a thoroughly good atomizer being ordered and the patient carefully instructed how to use it. Careless spraying with an imperfect instrument is quite valueless, and is very discouraging to the sufferer. After clearing the nasal chambers the mucous membrane may be protected by almost any of the bland oils which now abound in the market, albolene, glycoline, and benzoinol being probably the most perfectly unirritating. If there is much odor present, 5 grains to the ounce of menthol, oil of sassafras, or oil of cinnamon may be added to the oil, which is also to be used in an efficient atomizer. Home treatment is very easily overdone, and too much spraying is nearly as bad as none at all: the point is to keep the chambers free from crusts, and the sprays should not be used more frequently than is necessary to secure this result.

In addition to the above, thorough local treatment at the hands of the physician, carried out under the fullest illumination and inspection at intervals ranging from a few days to one or two weeks, is necessary. The mucous membrane must first be absolutely cleared by means of the anterior and posterior nasal atomizer, the syringe-catheter, or cotton tufts upon long aural applicators; in certain cases even the ear-forceps and an ordinary small rubber syringe may be required. The faradic current may then be used as directed above, and the membrane finally protected by one of the oil solutions: the appended formula is very frequently employed by the writer:

℞. Thymol., gr. iij;
Menthol., gr. v;
Albolene (liquid), f℥j.—M.
Sig. Use in atomizer.

As an alternative to the battery the whole membrane may be mopped with tincture of myrrh or galanga, slightly mitigated with glycerin, or sprayed with a watery solution of thymol or ichthyol. The thymol should never be used stronger than 3 grains to the ounce, being held in solution by the addition of a small percentage of alcohol and glycerin; even a 2-grain solution cannot be borne by some patients. Ichthyol is one of the latest remedies which has been lauded as valu-

able in atrophic catarrh; it may be used as a 1¼ per cent. solution, and is certainly useful in many cases. Its very unpleasant odor and taste are best disguised by the addition of menthol, but even so flavored it cannot be tolerated by sensitive patients. All powders, the galvanocautery (used as a "stimulant"), and Gottstein's cotton pledgets are far worse than useless in this disease, tending to increase the chronic inflammation and epithelial destruction. Certain forms of treatment much advocated in Continental literature, such as sterilizing baths, burring away (supposedly) softened bone, scraping off degenerated mucous membrane with the finger, etc., the present writer regards as unscientific and often grossly hurtful, with the rare exception, possibly, of in a few syphilitic cases.

Laborderie[1] has reported a number of cases of great improvement following skin-grafts from the interdigital membrane of the frog to the ulcerated surfaces in rhinitis cirrhotica. Theoretically, the treatment is a highly scientific one, and could the grafts be made from a membrane covered with columnar ciliated epithelium the results might be highly satisfactory. It should be remembered that destruction of the epithelial layer is the most essential and harmful lesion of the disease, and one which has heretofore defied all forms of treatment.

Constitutional tonic treatment is more necessary in rhinitis cirrhotica than in any other form of nasal disease, and the general health must be improved by every possible means. The broad indications are the same as in the hypertrophic process, but the patients are more apt to be feeble, with imperfect circulation, and must be treated accordingly. If syphilitic infection be present, remedies directed to that disease are of the first importance, and such cases frequently do better under proper treatment than those in which no such taint is present. Chronic inflammation of the lower air-passages is present in perhaps all cases of rhinitis cirrhotica, the relief of which is of course essential to improvement in general health. Change of climate is valuable in many cases; the less elevated regions of the Adirondacks, the Maine woods, and similar "spruce-areas" are very beneficial during the summer months, and the lower highlands of the Carolinas, the plateau of Mexico about Orizaba, and the hills of Southern California are to be recommended during the winter season.

SYPHILITIC AND TUBERCULAR RHINITIS.

Specific diseases of the nose call for much the same local treatment as the simple chronic inflammations of corresponding stages, the

[1] *Le Progrès méd.*, 1887.

constitutional therapeutics being by far more important. The deep ulcerations produced by breaking-down gummata should be cauterized by acid nitrate of mercury cautiously applied on a delicate applicator; even the galvano-cautery may be used in cases of rapid necrosis. The shallow ulcers are best treated by applications of nitrate of silver, a solution of 100 grains to the ounce of distilled water being usually employed by the writer. It is essential that the raw surface be wiped clean with absorbent cotton before using the medicine. Powdered iodoform is highly recommended in the treatment of syphilitic catarrh, and may be lightly dusted over the mucous membrane by the use of the laryngeal powder-blower. In cases of rapid ulceration constitutional treatment must be pushed to the limit of tolerance, and the general health improved by every possible means. Subsequent cicatricial deformity may produce serious symptoms which call for plastic operations or other measures which cannot be described here.

Tubercular rhinitis admits of palliative measures only, which have already been described under Atrophic Catarrh, a large number of cases of the latter disease being due to tuberculosis. It is the opinion of the contributor that efficient treatment of the naso-larynx will prevent extension of the disease and indefinitely prolong life in numerous instances.

INFLAMMATION OF THE FRONTAL AND MAXILLARY SINUSES.

In nearly every case of nasal inflammation, whether acute or chronic in type, there is more or less involvement of the adjacent sinuses, the frontal, maxillary, sphenoidal, and ethmoidal all being implicated. The two last-named cavities when diseased give rise to such obscure symptoms, and are so difficult of access, that no definite treatment can be recommended. The therapeutics of the frontal sinuses are in most cases, however, equally applicable to the ethmoidal and sphenoidal. Acute hyperæmia of the brow sinus, occurring in the course of an ordinary acute coryza, calls for the treatment already recommended for the latter disease, which will usually be found sufficient to control the symptoms. Attention to the condition of the digestive tract is, of course, always called for, and a mild cathartic may be given. The bromides of potassium and sodium given in large doses, 3 to 4 drachms in the first twenty-four hours, and 2 drachms *per diem* subsequently, have often an admirable effect on this condition.

Where deformity is evident and the pain great more energetic meas-

ures will be called for. In addition to the intranasal applications, atropine sulphate internally, $\frac{1}{480}$th of a grain every hour for twelve hours, or until the throat is very dry, may be ordered. If there is decided tumefaction in the region of the cavity externally, a blister of cantharidal collodion should be placed over the frontal sinus or just above it. The symptoms may be expected to abate in twenty-four hours under this treatment, especially if the patient can be confined to the house. Without treatment even the mildest class of cases are exceedingly apt to go on to suppuration, the duration of pain and deformity occasionally being from two to three weeks.[1]

The management of pus accumulations in the frontal sinuses belongs to the domain of surgery, and will be found described in all standard textbooks on that subject.[2] Early treatment at the hands of the rhinologist will, however, prevent this unfavorable termination in nearly all cases. "Catarrhal headache" from chronic congestion of these cavities is exceedingly common in cases of hypertrophic catarrh, and usually disappears as the nasal condition improves. Severe attacks may be promptly relieved by applications of cocaine, a small ball of cotton being saturated with a 5 per cent. solution, and by means of a delicate forceps tucked up in the region of the infundibulum, being allowed to remain for from five to ten minutes. Menthol in spray form is also a useful drug in all forms of catarrhal headache, and may be used more freely than cocaine. Bromides and atropine are probably the most valuable remedies for internal administration in this condition, large doses of the sodium salt seldom failing to give relief even in the severe headaches of advanced atrophic catarrh. Jurasz[3] advocates the use of a delicate probe for opening the infundibulum in cases of purulent inflammation of the frontal sinus, but the operation is one of very great difficulty, and, in the writer's opinion, of doubtful utility. Possibly medicated fluids might be introduced into the cavity by means of a delicate silver canula passed in the same manner as the Jurasz probe.

PURULENT INFLAMMATION OF THE MAXILLARY SINUS.

This is not a very common condition in nasal catarrh, the disease being more frequently due to dental caries and alveolar abscesses. When dependent on the latter causes, the removal of the offending tooth and thorough drainage of the antrum by drilling through the

[1] See paper on this subject by the writer, *Medical News*, Jan. 5, 1889.

[2] See R. A. Reeve, *Canadian Practitioner*, 1887.

[3] *Berlin. klin. Woch.*, 1887.

alveolar socket into the sinus are advocated. Various antiseptics may be subsequently injected into the sinus through the opening thus made. Purulent catarrh of the antrum, occurring as a sequel of acute or chronic rhinitis, rarely calls, however, for such vigorous measures. Many cases will get well without special treatment if the nasal lesions can be cured, and even severe examples will wholly recover without operative interference in many instances. The writer believes that fluids can be made to enter the maxillary sinus through its normal opening into the nasal chamber in most instances in which it is diseased, and that such treatment with properly chosen solutions will cure very many cases which have heretofore been subjected to operation. All swellings which interfere with drainage from the antrum must first be removed, temporarily by cocaine, or permanently by chromic acid or galvano-cautery "tackings." The patient is then instructed to lean the head toward the shoulder corresponding to the affected side, and an atomizer throwing a strong, coarse spray is introduced through the nasal speculum and pointed as nearly as may be at the opening of the sinus into the middle meatus. The spray may then be thrown into the nasal chamber with some force and for as great a length of time as the patient can bear it without much discomfort. The head is then leaned forward and the surplus fluid allowed to drain off, the spraying being then repeated two or three times, as may seem desirable. Several weeks of daily or tri-weekly treatments may be required, but convalescence is scarcely more prolonged than after operative interference, often much less so, and the patient is saved much pain and annoyance. Any non-irritating antiseptic solution may be used for the purpose, the peroxide of hydrogen being especially recommended by Ingalls and others; the appended formula is a favorite with rhinologists:

℞.	Listerine (Lambert),	f℥v;
	Acidi borici,	gr. xxx;
	Sodii boratis,	gr. viij;
	Aquæ rosæ,	f℥ij;
	Aquæ dest.,	q. s. ad f℥iv.—M.
Sig.	Use in atomizer.	

Opening the antrum from the middle or inferior meatus, as advocated by Mickulicz and others, must be considered an heroic procedure, to be undertaken with great reluctance even by an expert; extraction of a tooth, as previously suggested, is probably a much safer and simpler operation.

It is of course of great importance in all cases of disease of the maxillary sinus consequent to nasal inflammation that the nose should receive the most careful attention, and be brought to as near a condition

of normality as may be possible. Tumors and polypi of the antrum belong, like those found in the nasal cavities, to the province of surgery, and cannot be considered here.

ANOSMIA.

Anosmia and other derangements of the sense of smell offer little encouragement to the nasal therapeutist. When dependent on affections of the respiratory portion of the tract, relief of the former will often restore the lost sense, but when due to disease of the olfactory region or to central lesions, little or nothing can be done in most cases. The constant galvanic current is recommended by Spencer Watson, or faradism may be employed: Morell Mackenzie advocates insufflations of strychnine, $\frac{1}{24}$ grain in 2 grains of powdered starch representing a local dose. Syphilitic patients may be improved by specific treatment internally, and progressive doses of strychnine may be tried in almost all cases. When central or nerve-lesions are the causative factors, the therapeutic management must be directed to these conditions, the prognosis, however, not being favorable. Parosmia, or subjective derangement of olfaction, occurs in epilepsy and other nervous diseases, and its treatment belongs rather to the province of the neurologist than to that of the nasal therapeutist.

DISEASES OF THE PHARYNX AND LARYNX.

By CHARLES E SAJOUS, M. D.

The fact that the subjects treated of in this article include many that are seldom met with in general practice has led the writer to introduce, in a few instances, a brief description of their etiology and symptomatology. This departure from the general plan of the work has been made in order to carry out better its object in the practical sense, and avoid the necessity of research when time is precious. This is the more necessary since the subjects alluded to are within the territory of a specialty, the knowledge involved being hardly of a kind expected in the general practitioner, for whose benefit this article is principally written.

The lines of treatment indicated are those supported by clinical experience—a selection worthy of the reader's confidence. Had promiscuous therapeutical observations been noticed, the entire volume would hardly have sufficed, and much confusion would have ensued. The recent methods which have been alluded to have been selected from among those presenting reasonable indications that they would not very soon be relegated to oblivion.

DISEASES OF THE UVULA.

Uvulitis.

Although inflammation of the uvula without involvement of the pharynx is seldom seen, it nevertheless may occur as a result of continued and forcible hacking to dislodge accumulated mucus in the pharyngeal vault, of traumatism, or as a local manifestation of a diathetic disorder. The uvula suddenly becomes red and swollen, giving rise to pain during the act of deglutition, and to an irritating cough when the infiltration of the tissues is such as to cause elongation of the organ.

The local application of a 20 per cent. solution of hydrochlorate

of cocaine with a camel's-hair pencil every two hours arrests the unpleasant symptoms, by contracting the tissues and depleting them. In case of inability on the part of the patient to carry out this treatment properly, a lozenge composed of $\frac{1}{6}$ grain of cocaine and 2 grains of powered coca-leaves may be substituted. Scarification may be practised with advantage when the congestion is marked. The parts around the uvula being thoroughly anæsthetized with a 10 per cent. solution of cocaine, a tea-spoon, held in the left hand, is passed behind the organ, the hollow surface of the bowl serving as a support for it and as a shield for the pharyngeal wall. A bistoury is then used to prick the inflamed surfaces a few times, bleeding being encouraged by gargling with lukewarm water.

Elongation of the Uvula.

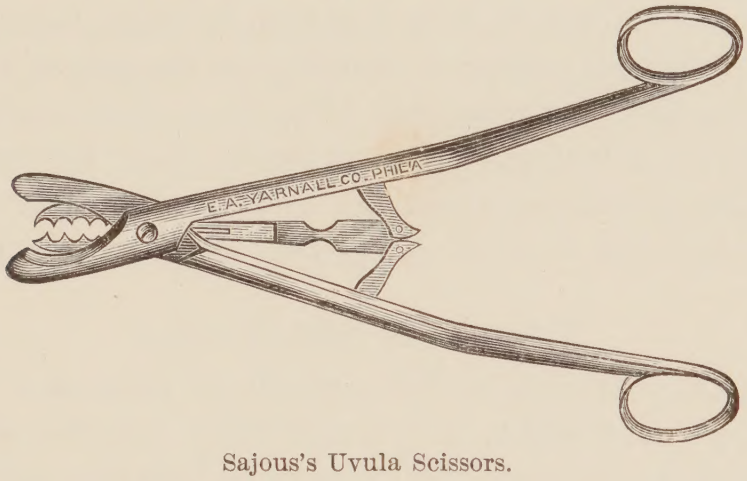
Elongation of the uvula occurs in the majority of cases as a result of chronic catarrhal affections of the posterior nasal cavity and of the pharynx. It is not so much due to extension of the inflammatory process proper as to the irritation induced by the constant hacking and scraping to which catarrhal cases usually become accustomed, and to the additional irritation of passing discharges. General weakness and anæmia through loss of muscular tone may also allow the soft palate to droop on the tongue, thus simulating true elongation of the uvula and giving rise to the same symptoms. Gastric and hepatic disorders, by disturbing the equipoise of the circulation, may maintain a pharyngeal congestion capable of involving the soft palate and uvula, and induce elongation of the latter. Disorders liable to cause paralysis, as diphtheria and scarlatina, may also become etiological factors, and, by causing depression of the soft palate, at least simulate an elongation as complete in symptomatic expression as that due to inflammatory processes.

The elongation may be temporary, and may follow the course of an acute pharyngeal congestion, the uvula becoming at times œdematous and much enlarged. In such cases the treatment adopted for the reduction of the inflammatory process is usually sufficient to restore the uvula to its normal state. Much assistance may be obtained, it may be added, in the treatment of these cases by scarifying the organ. Snipping off a small piece at the end, as recommended by some authors, while relieving much the existing infiltration, is hardly warranted, delaying as it does the final recovery until the cut surface has completely healed.

When the elongation is unaccompanied by active inflammation, or, in other words, is present when its own and the surrounding tissues are not congested, medication is useless. Temporary contraction may be obtained by means of strong astringents, such as tannin, sulphate

of copper, etc., but such treatment merely deludes the patient, who soon returns as badly off as before. Shortening by removal of a piece *representing the extent of the elongation* is the only effective measure, and is sometimes followed by results as surprising to the patient as they are gratifying to the surgeon.[1] The operation may be accomplished with a pair of long curved scissors, the uvula being steadied with a pair of suitable forceps. This procedure, although apparently easy, is at times quite difficult, owing to the constant up-and-down motion of the uvula. Again, the scissors, in closing, allows the organ to slip out of its grasp after cutting perhaps half way through it. A much more satisfactory method is that by the use of the scissors shown in the accompanying figure:

FIG. 12.



Sajous's Uvula Scissors.

The instrument being held with the palm of the hand directed toward the operator—that is to say, with the thumb and finger passed through the rings from below upward (the bend being just sufficient to prevent interference with the line of vision)—it is introduced closed into the mouth. As soon as the point has reached the uvula the rings are separated, and the organ hangs between the teeth of the claws. The rings being now approximated, the claws close on the uvula *before* the blades touch it (a feature possessed by no other uvula scissors), hold it fast, and bring it forward by bending it at its base. The scissors cutting it in that position, the cut surface is *oblique* and posterior. When food is swallowed the horizontal surface obtained with other instruments is scraped and kept sore for several days by the passing food. With the oblique surface facing posteriorly, obtained with this instrument the bolus only touches the anterior surface of the stump, the cut surface resting against the pharynx, and therefore out of the way of the passing foreign substances. The healing process is more rapid; a

[1] Many cases presenting all the physical symptoms of catarrhal phthisis have been suddenly cured by the removal of a greatly-elongated uvula, which by irritating the larynx caused exhausting cough. Two such cases have been observed by the writer.

better stump is obtained; slipping of the uvula between the blades is impossible; and the cut is always complete. A 20 per cent. solution of cocaine, applied four minutes before the operation, renders it painless and prevents the slight bleeding which otherwise usually occurs.

An after-effect of the operation is slight local pain, increased by the act of deglutition. Well-seasoned food, hot liquids, and smoking should be avoided. A lozenge containing $\frac{1}{12}$ of a grain of cocaine and 2 grains of powdered leaves of coca, allowed to dissolve slowly in the mouth, greatly alleviates the slight pain present.

As a rule, too much of the organ is removed, and cases in which no trace of it is left are not uncommon. It is true that the soft palate seems to accommodate itself to the malformation resulting from bad surgery by performing more or less accurately the functions of the absent organ, but, nevertheless, cases have been met with in which these functions are imperfectly performed, owing to inability on the part of the soft palate to close completely the naso-oral isthmus during deglutition. As much should be left of the organ as would about represent a normal one. The stump assumes a rounded shape, and enough of the azygos uvulæ is always left to meet all physiological requirements.

Tumors of the Uvula.

Papillomata, occurring in the majority of cases as a manifestation of tuberculosis or syphilis, are occasionally observed on the uvula. Other forms of tumor, cysts,[1] and angiomata [2] are also met with, though very rarely. Extravasation of blood into the uvula,[3] giving it a club-shaped appearance, and due to contusions through unskilful handling of instruments, may simulate an angioma.

Tuberculous growths are best overcome by means of lactic acid applied to the surface left after excising the body of the tumor with the scissors. The application may be made with a camel's-hair pencil, care being taken to avoid dripping. It should be repeated daily until complete resolution has taken place. For syphilitic growths nitrate of silver should be substituted for the lactic acid, the preferable mode of application being that involving the use of the probe. The tip of the instrument, being heated over a lamp, is then applied against a crystal of the salt, which at once dissolves and closely adapts itself to the metallic surface in cooling. On contact with the wound the nitrate of silver again deliquesces. Care should be taken to include all parts of the diseased surface in the application, which should be repeated as soon as the whitish scab formed has disappeared.

In the other forms of tumor, chromic acid, used in the same man-

[1] Two personal observations, among others.

[2] Chipault, *Revue mensuelle des Maladies de l'Enfance*, June, 1890.

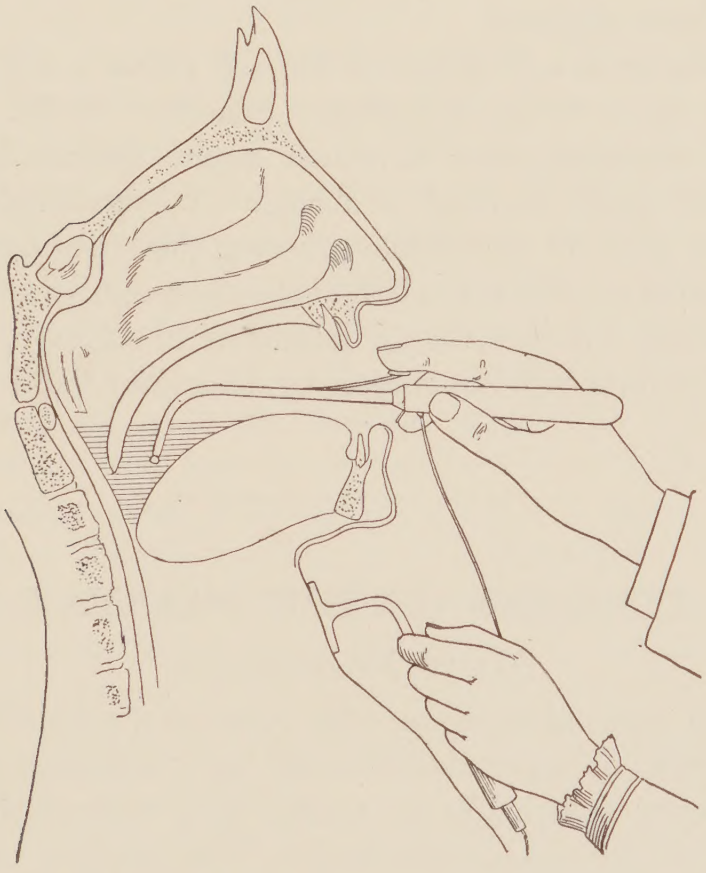
[3] Schech, *Diseases of the Mouth, Throat, and Nose.*

ner as the nitrate of silver, described above, is of service in the removal of small soft and sessile growths. When opportunity is furnished by pedunculation either to snare or snip the neoplasm off, it is always best to take advantage of it, thus greatly promoting the chances of early resolution, and also limiting to a marked degree unpleasant secondary symptoms, such as local inflammation and pain. The galvano-cautery is an efficient agent in the treatment of diminutive and non-inflammatory growths, a bright cherry heat being the most effective.

Neuroses of the Uvula.

Paralysis.—Paralysis of the uvula is usually associated with corresponding affections of the palate, resulting in their turn from general affections; diphtheria, for instance, is a prolific cause. The palate remains motionless during deglutition or other acts normally requiring its elevation or approximation to the pharyngeal wall, this symptom being present in addition to any of the symptoms usually accompanying elongation. In cases of paralysis, both general and local treatment

Fig. 13.



is indicated, arsenic in the form of Fowler's solution being administered in increasing doses, beginning with 3 drops three times daily, taken in half a tumblerful of water immediately after meals. The faradic current is by far the best form of electrical stimulation obtain-

able. It may be applied directly to the palate by means of a laryngeal electrode of the form shown in the cut (Fig. 13), or better still through water held in the mouth by the patient by simply bending the head backward as shown in the figure. The negative pole is connected with the mouth electrode, while the positive is connected with that used externally, over the thyroid cartilage. The current should be very mild at first, and gradually increased with the patient's ability to stand it. One mouthful of water is held in the mouth as long as he can hold his breath, when another mouthful is taken. The external or neck electrode should be kept moist during the application to ensure penetration of the tissues by the current. The sittings should not last more than ten minutes, but be repeated daily. This method, which the author has not seen described elsewhere, ensures thoroughness of application; every part of the soft palate is reached, and, contact between the mucous membrane and the metallic surface being avoided, the faradization can be continued much longer without discomfort to the patient.

Rosenzweig[1] indorses the treatment proposed by Henoch, which consists in injections of strychnine, $\frac{1}{32}$ to $\frac{1}{20}$ of a grain daily, the neck being the seat of injection. Recovery took place in from three to nineteen days in the cases reported.

Reflex Neuroses.—Neuroses of the soft palate and uvula may also be dependent upon reflex irritation. Schadle[2] of St. Paul, Minn., observed an interesting case in which rapid spasmodic raising and lowering of the parts occurred as a result of hypertrophy and hyperæsthesia of the mucous membrane covering the turbinated bodies, and which disappeared as soon as the latter were thoroughly cauterized. Cases of the same kind, but less clearly defined as to etiology, were recently added to the literature of the subject by Dieulafoy[3] and Legroux.[4]

DISEASES OF THE PHARYNX.

Acute Pharyngitis.

Although acute pharyngitis may occur as a manifestation or concomitant symptom of many disorders, the early appearances of the pharynx do not vary sufficiently to render very trustworthy a diagnosis established solely upon local examination. The pharynx usually presents irregularly distributed redness, patches of congestion implicating, in the majority of cases, the posterior pillars. In severe cases the anterior pillars, the uvula, and the tonsils are also involved, the redness being

[1] *Therapeutische Monatsh.*, April, 1891.
[2] *Journal Am. Med. Association*, Oct. 20, 1888.
[3] *La Semaine médicale*, Nov. 12, 1890.
[4] *Ibid.*, Nov. 26, 1890.

greater and more evenly distributed. The general symptoms, if any are present, usually indicate a marked case; a feeling of lassitude, headache, and slight increase in the superficial temperature being the usual train of sensations experienced. The treatment should consist of two distinct parts—the first tending to abate the local symptoms by direct treatment, the second consisting of measures calculated to combat the disorder acting as exciting cause.

Whatever be the origin of the affection, the local measures are always of service, the aim being to deplete the engorged blood-vessels and the infiltrated tissues. Cocaine would be an ideal remedy in these cases were its effects more lasting and the reaction following its use (owing to temporary paresis of the blood-vessels) not undesirable. Better than cocaine is 40-grains-to-the-ounce solution of nitrate of silver, which, applied once a day with a large camel's-hair pencil (carefully avoiding dropping into the larynx), after drying the pharyngeal walls with an absorbent cotton pledget, not only produces the desired effect upon the tissues, but anæsthetizes them sufficiently to arrest the local pain, which at times is quite severe, especially when the act of swallowing is performed. A weaker solution of nitrate of silver would be irritating instead of palliative. A lozenge containing $\frac{1}{10}$ of a grain of cocaine, 1 grain of borate of sodium, and 1 grain of chlorate of potassium, dissolved in the mouth every two hours, greatly assists the preliminary procedure. Tannin dissolved in glycerin, 40 grains to the ounce of the latter, serves a good purpose, in children especially, but it should be applied with a cotton pledget at least three times daily to bring about any result. A very effective treatment, when local applications cannot be practised and when the patient can remain at home, is the inhalation of the vapor of water charged with the fumes of benzoin. One drachm of the tincture being placed in a tea-cupful of very hot water, the cup is covered with a towel folded into a cone; the mouth being then placed over the upper opening, the steam evolved is inhaled as long as it is generated. Lozenges containing 3 grains of the resin of guaiac, as recommended by Morell Mackenzie,[1] may be substituted when the patient is obliged to go out of doors. Another method of real value is that recommended by Concato and Bufalini,[2] consisting in spraying the pharynx with ether every two hours for three or four minutes.

Of great importance in the treatment of acute pharyngitis is a proper recognition of the influence exercised by disorders of neighboring parts in maintaining the pharyngeal inflammatory process in a state of activity. Intranasal disease, it must always be borne in mind, is one of the most prolific causes of pharyngitis, and measures addressed to

[1] *Diseases of the Pharynx, Larynx, and Trachea*, London, 1880.

[2] Schech, *Diseases of the Mouth, Throat, and Nose*, Blaikie's translation.

the nasal cavities, anterior or posterior, should form one of the most important elements of the curative method adopted. In fact, this is so true that the pharyngeal disorder will often be observed to fluctuate with the changes noted in the nasal affection. The treatment of the latter does not belong to this section, but it will not be out of place to state that absolute cleanliness of the nasal organs, maintained by the bi-daily use of a wash consisting of 1 drachm of bicarbonate of sodium dissolved in a pint of lukewarm water and snuffed into the nose from the palm of the hand, will actively influence recovery if carried out with the measures already recommended.

Hepatic engorgement is the cause of often-repeated attacks in a small proportion of the cases, and if this tendency to frequent recurrence exist and the nose be normal, the liver will generally be found to form the basis of the trouble, the local treatment becoming in that case of secondary importance. A saline purgative is here of infinite value, followed by the administration of phosphate of sodium, two tea-spoonfuls night and morning, to stimulate the liver gently until its normal activity is restored. A pill composed of calomel 3 grains and extract of belladonna $\frac{1}{4}$ of a grain, taken at night until copious evacuations have been obtained, is another means usually followed with prompt results.

Catarrhal gastritis is a frequently observed etiological factor in over-eaters and tipplers. These cases are often unsatisfactory, owing to the difficulty experienced in obtaining a change in their habits. Copious draughts of hot water, sipped night and morning, with bismuth, 10 grains before meals, and an occasional purgative, seem to do all the good that can be expected. When the physician's wishes as to a modification of habits are complied with, the patients soon recover completely, especially if local treatment is added to the systemic measures adopted.

In a small proportion of cases the pharyngeal affection is associated with the manifestations of a general diathesis, such as rheumatism and gout, muscular and articular pains being quite evident reminders of the existence of this association. Salicylate of sodium, 15 grains every three hours, actively modifies the whole train of symptoms, very often after three or four doses only have been taken.

Membranous Pharyngitis.

This is a rather more severe pharyngeal disorder than the preceding, also consisting of an acute superficial inflammation, but characterized by the exudation of a whitish substance or false membrane, and often mistaken for diphtheria. The early subjective symptoms of both diseases also present much analogy. The septic character of membranous pharyngitis is distinctly shown by the results of a treatment based

mainly upon this hypothesis, supplemented with general tonics, the disease being usually met with in persons weak in health and ill able to withstand the proximity of affections such as diphtheria, scarlatina, etc. or other infectious diseases. A solution of permanganate of potassium, 10 grains to the ounce, is an effective agent to check the local trouble. It should be applied with a camel's-hair pencil every two hours over the inflamed parts, after carefully cleansing them of all false membrane by means of a pledget of cotton fastened to the end of a probe. A mild aperient, the salines being preferable, is always of value in these cases. Salol is highly recommended by Gouguenheim[1] of Paris; but it must be administered in large doses—1 drachm three or four times a day, supplemented with a spray of boric-acid solution, the diet being confined meanwhile to milk.

Boislimiere[2] of St. Louis employed the following formula in a large number of cases, and obtained recovery in from twelve to thirty-six hours—a great gain in time, as the average duration of the affection is from two to five days:

℞. Sodii benzoatis, ʒj to iv;
Glycerini,
Elixir. calisayæ, āā. fʒj.—M.
Sig. One tea-spoonful every one or two hours.

The severe dysphagia often present renders necessary the exhibition of anodynes. The remedies indicated for the same purpose in acute pharyngitis will serve advantageously in the membranous form.

As tonics the preparations of cinchona, arsenic, and strychnine are of especial value. When slight stimulation is necessary—it is generally requisite in asthenic cases—the Mariani wine of coca is by far the most effective agent, a wine-glassful to be taken one hour after meals.

Follicular Pharyngitis.

This form of pharyngitis, commonly termed "clergyman's sore throat," is most prevalent among persons who in their avocations are obliged to use the voice extensively—preachers, lawyers, singers, army officers, etc. The principal pathological conditions characterizing it, in addition to the vascular engorgement of chronic pharyngitis, are the presence of a number, more or less great, of rounded projections, reddish in color, with white apices, standing out like pimples from the surface of the membrane.

The treatment of follicular pharyngitis includes, besides the gene-

[1] *Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, Sept., 1890.

[2] *St. Louis Courier of Medicine*, Feb., 1888; ref. in *Annual of Universal Med. Sciences*, series 1889.

ral and local measures indicated for simple acute pharyngitis, surgical procedures for the active destruction of the inflamed follicles, the main foci of inflammation. Galvano-cautery has given by far the best results. Besides being a painless means, it gives rise to no disagreeable after-symptoms and does its work effectually. A small loop twisted at the end, so as to form a miniature corkscrew, is the most satisfactory electrode; it penetrates deeply into the inflamed follicle, and gives rise to no secondary disturbance, especially if the tip be brought to a bright cherry heat. Each engorged follicle should be touched after carefully cleansing the pharyngeal wall with an alkaline spray. Not more than four or five follicles should be burned at each sitting, several days being allowed to elapse before another series of cauterizations is attempted. Hardly any discomfort is caused during the operation, slight local soreness, lasting a couple of days, representing about all the after-effects that occur. With the destruction of the follicles disappears the surrounding inflammation, and almost immediate relief ensues. When the superficial vessels are large and show evidences of varicosity, the larger ones should also be cauterized, the tip being applied a couple of times along the portion showing through the membrane.

When a galvano-cautery battery cannot be had, actual cautery may be substituted, although it offers by no means the same certainty of a favorable result. A good-sized piece of wire, mounted upon a wooden handle, is heated to a red heat in the flame of an alcohol lamp and applied to each follicle, the manipulation being conducted rapidly to avoid cooling of the wire during its excursion between the lamp and the pharynx. The after-effects of the applications are the same as those following galvano-cautery, unless the flame of an oil lamp or gas be employed, when the carbonaceous deposit formed at the end of the wire may greatly retard resolution of the cauterized spots by introducing into the wound irritating particles of lampblack.

Nitrate-of-silver cauterizations are much less effective than either of the two preceding. An instrument such as that used for actual cautery may be employed. Its tip being heated over an alcohol lamp, it is applied against the nitrate-of-silver crystal, enough of which will adhere for the cauterization of two follicles. Resolution does not take place as rapidly as when the other methods are used, and more time should elapse between the sittings.

The follicles once destroyed, treatment for the chronic inflammation existing in the membrane proper should be continued until the normal color of the pharynx returns.

Pharyngo-mycosis.

The white or yellowish deposits characterizing this affection, and

usually found in the crypts and folds of the tonsils, must be removed with a small curette, each cavity being thoroughly emptied. At times the base of the tongue and projections of mucous membrane may become more or less covered with them, adding greatly to the fœtidity of the breath. The origin of the *Leptothrix buccalis* being generally due to carious teeth, treatment of the latter is of first importance. The tartar at the base of the teeth being also a prolific field for the *Leptothrix buccalis*, the patient should be advised to cleanse his mouth and teeth carefully at least once a day. Bryson Delavan[1] recommends a solution of mercury bichloride, 1 : 2000, applied to each crypt after cleansing. Nitrate of silver dissolved by heat on the end of a probe is also quite effectual, while galvano-cautery may be considered as the most satisfactory agent to prevent recurrence of the disease. Bogroff of Odessa[2] recommends fuchsin in saturated solution, mixed with a 1 : 1000 solution of corrosive sublimate.

Dry Pharyngitis.

Dry pharyngitis, also termed atrophic pharyngitis, generally finds its origin in a long-standing post-nasal catarrh and as a sequel of chronic or follicular pharyngitis. Its remote cause may therefore be traced to all the etiological factors entering into the production of these affections. In old people it frequently occurs as a manifestation of senile debility. Its principal feature is the absence of lubrication due to the deficient glandular action, and as a result the membrane appears dry and lustrous, with perhaps streaks of muco-purulent post-nasal discharge adhering tenaciously to its surface. The membrane becomes sometimes greatly thinned, and occasionally cases are met with in which this reduction in thickness causes the conformation of the vertebræ lying behind the membrane to be distinctly seen.

In young people dry pharyngitis can generally be cured, but in the aged such a result is seldom obtained. Of primary importance in the treatment of this affection is cleanliness of the naso-pharynx and pharynx, to limit as much as possible one of the existing causes of the inflammatory process—contact with the naso-pharyngeal secretions, which are almost always extremely irritating. Chlorate of potassium, 1 drachm to the pint of lukewarm water, inhaled into the nose from the palm of the hand and allowed to pass into the mouth by tilting the head backward, meets the indications more satisfactorily than other agents, owing to its tendency to maintain the parts in a moist condition. The trouble being frequently kept up by the inhalation of dust and other irritating substances, by sleeping with the mouth open, etc., careful examination to ascertain the presence of any such irritating cause should

[1] *Annual of the Universal Medical Sciences*, vol. iv. p. 285, series 1888.

[2] *British Med. Journal*, Aug. 15, 1891, from *Vratch*, No. 16, p. 411, 1891.

be made. Of greatest value in these cases is the application of electricity, suggested by Shurly of Detroit some years ago. Instead, however, of galvanism, which he recommends, the writer uses faradism, the negative pole being applied to the pharynx. The method of application is that described and illustrated on p. 443. Daily sittings are necessary for about two weeks, then every other day, after which they can gradually be diminished in number. The only drug found to have a favorable influence upon the atrophied membrane is nitrate of silver (10 grains to the ounce of water), which, applied with a cotton pledget every other day, produces marked relief in almost all the cases treated. Too stimulating a remedy should be avoided, the resulting inflammation being more harmful than beneficial. Oleoresin of cubebs, 15 drops, taken on a lump of sugar three times daily, is of value until it begins to disorder the stomach. Systemic disturbances, principally those of the digestive apparatus, contribute greatly to the continuance of the trouble, and should be carefully sought after and corrected.

Tuberculous Pharyngitis.

Tuberculosis of the pharynx generally presents itself as a complication of pulmonary or laryngeal tuberculosis, or of both, rarely preceding them. Much can be done to alleviate the intense suffering to which it gives rise, especially during the act of deglutition, but a cure can hardly be hoped for unless the local trouble be absolutely primary and the case be seen early.

Touching each shallow grayish ulcer with a 20 per cent. solution of cocaine, and, as suggested by Krause of Berlin and Heryng of Warsaw, scraping it thoroughly with a curette, and then applying to each scraped spot lactic acid, gives very satisfactory results when the ulcers are not too deep. As a rule, however, the application of anything but sedative agents causes great pain, and seldom does much good. Of the sedatives, cocaine is certainly the most effective and seems at times to promote resolution. Lozenges are not an advantageous form for its application, owing to the frequent necessity of swallowing induced. It is best to familiarize an attendant with the use of a camel's-hair pencil, and to instruct him to touch the spots of ulceration whenever pain is present. After each application iodoform should be spread over the ulcers also (using another camel's-hair pencil to do this), and the patient be requested to keep the mouth open for a couple of minutes. This treatment, repeated several times daily, is very soothing to the parts, and often yields very satisfactory results. Iodoform is not as disagreeable to the taste as it is to the sense of smell. Soft and lukewarm food and but slightly seasoned will soon be found to cause the least pain. Morphine, belladonna, and all drugs causing

dryness of the throat when administered internally should be strictly avoided, the dryness greatly increasing the suffering.

Syphilitic Pharyngitis.

The three stages of syphilis may become manifest in the pharynx. Primary syphilis is rarely met with, and its local manifestations, corresponding with those of the other parts of the oral cavity, either disappear spontaneously or yield to the application of nitrate of silver fused to the end of a probe. In the secondary form a solution of nitrate of silver (30 grains to the ounce) gives greater satisfaction than the solid stick; it should be applied with a camel's-hair pencil to each blotch after thorough cleansing with an alkaline solution. Internally, the red iodide of mercury should be given in doses of $\frac{1}{16}$ of a grain three times a day, and be continued until the first evidences of ptyalism occur, when a course of iodide of potassium, administered as indicated below, will be of service to eliminate the mercury from the system. While this treatment is being conducted the teeth should be kept scrupulously clean, and mouth-washes containing either borax or chlorate of potassium be frequently used. These precautions, besides contributing to the patient's comfort, influence markedly the spread of the local manifestations. The general health should be looked to with care, and tonic and nutritive preparations administered. Cod-liver oil and malt or cod-liver oil emulsion serve a useful purpose in both the second and third stages. The use of alcoholics and smoking should, however, be strictly interdicted. They both tend to greatly aggravate the ulcerative process. The food should be non-irritating as to the condiments, and not be taken hot. Frequent bathing is always advantageous.

In the tertiary form iodide of potassium is much more effective than mercury. Beginning with 10 grains three times a day, 1 grain is added to each dose until 40 grains are taken at a time. Iodism generally supervenes when the half of that quantity is taken, but it is not disadvantageous to continue the administration of the iodide notwithstanding the eruption and the coryza. These unpleasant complications can quickly be mastered by the use of Fowler's solution, 3 to 5 drops after each dose of the iodide. The continuation of the iodide should depend upon the effect produced, and as soon as evidence appears that the remedy is mastering the disease the dose should be decreased as it was increased, one grain at a time. In some cases iodide of potassium deranges the stomach. This usually occurs when it is given dissolved in a small quantity of excipient. If each dose is administered, however, in a large tumblerful of pure water, these evil effects will be avoided.

The local treatment, as in all other specific ulcerations, becomes

much more effective if the parts are kept in the cleanest possible state. This may be done by the patient himself by means of gargling, detergent washes containing borate of sodium, bicarbonate of sodium, or chlorate of potassium being employed. One drachm of either dissolved in 1 pint of water forms a solution that may easily be prepared by the patient. Every other day the ulceration should be touched with nitrate of silver in the manner already explained. Pain during deglutition is usually the most severe symptom. Most effective in overcoming this very distressing feature of the local manifestations is of course cocaine in the form of a 10 per cent. solution. It can be used as a spray, the patient being advised to use the atomizer only sufficiently long to enable him to feel the moisture over pharyngeal surfaces. If the spray is used four or five minutes before meals, the patient will be able to partake of much more food than he otherwise would—an important element in the ultimate results of the treatment.

Adhesion of the soft palate to the pharynx and other deformities sometimes follow syphilitic ulceration in this region. Operative procedures then become necessary to restore the parts to a condition approximating the normal as much as possible as to conformation and function.

Erysipelas of the Pharynx.

As in erysipelas of other portions of the system, measures to support the patient and to abate the fever are of primary importance. The efflorescence of the affection is preceded by a well-marked febrile stage, which lasts two or three days, and during which the temperature may surpass 103° F. As soon as the erysipelatous blush appears, however, this high temperature tends to decline, again to reach its height as soon as the eruption has thoroughly developed. Veratrum viride, recommended by many authors, is in the writer's opinion too depressing. Aconite in small doses frequently repeated serves the same purpose, without presenting this untoward feature. It may be conveniently administered with the tincture of the chloride of iron, one advantage of which is that it limits the local manifestation by its astringent action as it passes the inflamed surfaces on its way to the stomach. The following prescription serves the purpose satisfactorily:

℞. Tinct. aconiti, ♏x;
Tinct. ferri chloridi, ʒij;
Glycerini, ʒss;
Aquæ, q. s. ad ʒiij.

Sig. One tea-spoonful to be taken every half hour until temperature and pulse are influenced; afterward every hour.

The erysipelatous blush is bathed with the mixture during the act of deglutition, and remains under the influence of the astringent until the next dose is taken. The continuous action which is thus obtained greatly limits the duration of the local inflammatory process.

Bedford Brown[1] insists upon the importance of counter-irritation applied to the neck and chest "for the purpose of inducing a migration of the inflammation." Although the writer has not as yet acted upon this recommendation—most probably a valuable one—he would be inclined to choose the region of the liver as the seat of counter-irritation, basing this selection upon the remarkable results obtained by the same procedure in the treatment of epistaxis, and which no other region of the body seems to furnish.

The local pain may easily be mastered by means of a 10 per cent. solution of cocaine, the excipient used being mint-water. The headache, usually quite marked, can be greatly benefited by snuffing $\frac{1}{8}$ grain of morphine every two or three hours. The opiate is absorbed by the nasal mucous membrane, and taken in this way is more effective in headache than if taken by the mouth. Cold compresses may be employed in addition with advantage. The morphine should not be continued too long, lest it cause constipation. The bowels, on the contrary, should be kept free by means of salines, Hunyadi Janos water, etc.

The diet should consist of soft food, milk and its preparations being of special advantage. Alcoholic beverages are irritating to the local lesion on their passage to the stomach, but they may be administered, should stimulants be required, by means of soft gelatin capsules, slightly moistened before placing them in the patient's mouth.

Retro-pharyngeal Abscess.

The fact that retro-pharyngeal abscess is almost always met with in children renders an early diagnosis more difficult, and proportionately decreases the chances of success when efforts are made to arrest progress before pus is formed. If fluctuation be not present, however, the administration of iodide of potassium in full doses, coupled with the frequent local application by means of a camel's-hair pencil of a solution of iodine in glycerin (10 drops of the tincture to the ounce of glycerin), often succeeds in arresting the development of the abscess. The case should be watched, however, owing to the tendency of the iodide of potassium to cause œdema. Should infiltration of the tissues of the pharynx appear, the drug should be stopped and the infiltration reduced by the application of a 10 per cent. solution of cocaine, repeated every hour until all signs of it have disappeared.

When the abscess is found to contain pus the only treatment is

[1] *Journal of the Am. Med. Association*, quoted in *Annual of the Universal Med. Sciences*, series 1888.

evacuation by freely opening it with a bistoury or by means of a trocar and aspirator. The former is the quicker method, but it exposes the patient to suffocation by the flow into the larynx of the pus suddenly liberated. The least dangerous mode of procedure is that proposed by MacCoy of Philadelphia. A small vertical incision is made at the upper portion of the swelling, above the point of greatest tension, to relieve the latter. After the flow of a small quantity of pus, the tension will be found to have been relieved, and the incision can be extended with less danger, the abscess being then gradually emptied by digital compression. As soon as the cut in the abscess shall have been made, the patient's head should suddenly be tilted forward, to cause as much of the pus as possible to flow out of the mouth. The discharge continues for some time, the cavity growing smaller and smaller until the wound closes.

When the aspirator is employed a curved trocar should be used, and its point inserted upward into the most prominent portion of the growth. This is the simplest and least dangerous operation, and may be made painless by the preliminary application, with a camel's-hair pencil, over the seat of the abscess, of a 10 per cent. solution of cocaine. The general health of the patient should be carefully looked into, and adequate means employed to correct any systemic disorder that may be discovered. A scrofulous diathesis is present in almost all idiopathic cases, which represent at least 90 per cent. of the total number. Retro-pharyngeal abscess is an occasional complication of scarlet fever and of cervical spondylitis. This, however, in no way modifies the form of treatment recommended.

Tumors of the Pharynx.

Epitheliomata, sarcomata, fibro-sarcomata, osteomata, adenomata, papillomata, cysts, adeno-chondromata, and pilose tumors have been observed in the pharyngeal cavity. Removal may be effected in some cases by electrolysis, the snare, or galvano-cautery. Malignant tumors, however, should be removed bodily. This subject comes within the scope of treatises on surgery, to which the reader must be referred.

Neuroses of the Pharynx.

Hyperæsthesia.—Hyperæsthesia frequently follows local manifestations of infectious diseases, the exciting element being a slight superficial congestion, not sufficiently marked to provoke pharyngitis, but great enough to produce an exaggerated action of the sensory nerve-supply. Any continued irritation—smoke, dust, an elongated uvula, etc.—may also act as an exciting cause, while disorders of the digestive apparatus frequently maintain an excessive sensitiveness quite difficult to overcome.

The superficial congestion following infectious disorders readily yields to an astringent, especially if preceded by an application of a 40 per cent. solution of nitrate of silver. The contraction of the blood-vessels induced by the latter is best continued by a spray of resorcin, 8 grains to the ounce, alternating with an alum solution, 10 grains to the ounce, every other day. The applications should be made at least four times daily to keep up the constricting action of the astringents. Cocaine is pernicious in these cases, owing to the weakened state of the local blood-supply. In the other forms of hyperæsthesia enumerated the exciting cause should first be removed, and the same local treatment employed.

Anæsthesia is usually of central origin. It may be met with in connection with other nervous disorders, such as epilepsy and hysteria, and as a sequel of infectious disorders—the paralysis following diphtheria, for instance. It is said to occur in typhus fever and cholera, and to be common in general paralysis of the insane.[1] Treatment of these cases naturally corresponds with that of the central disorder which forms the primary cause.

Motor paralysis also generally finds its cause in a central disorder, the removal of which is essential to obtain a satisfactory result.

On general principles, strychnine hypodermically and general tonics are almost always indicated. Arsenic is especially valuable when the neurosis present is a sequel of diphtheria. Electricity serves the double purpose of assisting in the diagnosis and restoring motion. When the paralysis is of central origin, an interrupted current will cause contraction of the muscles, whereas this contraction will not occur if atrophy of the muscles is the principal pathological element present. In the latter case a cure need hardly be expected. Therapeutically, the method of applying electricity described on p. 444 will serve a useful purpose.

Foreign Bodies in the Pharynx.

The objects most frequently found in the pharynx may be divided into those presenting asperities, such as pins, needles, fish-bones, tacks, bristles, etc., which the contractions of the constrictors in deglutition force into the pharyngeal walls; and those whose dimensions do not allow their passage into the œsophagus—pieces of meat, bread-crusts, coin, etc.

In cases in which a small, sharp object is said to have been swallowed it is well to bear in mind that localized spots of irritation, such as inflamed follicles, frequently give rise to sensations resembling precisely those produced by such a foreign body. These sensations may also be due to scratches produced by the roughness of a piece of dry

[1] Lennox Browne, *The Throat and its Diseases*, London, 1887.

bread-crust, chicken-bone, oyster-shell, etc. accidentally swallowed. To these elements of error may also be added the imaginary foreign bodies of hysterical women.

The laryngeal mirror should first be employed to locate the foreign body, this being greatly assisted by the subjective symptoms and the indications of the patient. A satisfactory examination of the parts is not always possible, however, owing to the marked congestion present. The index finger of the right hand may then be employed, its palmar surface being always directed toward the posterior pharyngeal wall, not only to ascertain the location of the foreign body, but to seize it if its form enables it to insinuate itself between the nail and the finger, provided the former be somewhat long. Pins, needles, tacks, spicules of bone, etc. may easily be removed in this manner. To hold the object solidly the palmar surface of the finger is firmly pressed against the nearest surface as it is withdrawn with the foreign body. When it is too large to be grasped in this manner, the finger should be kept on the foreign body until a suitable curved forceps can be introduced, and, guided by the finger, made to grasp it strongly. A 10 per cent. solution of cocaine applied before these manipulations greatly facilitates them. Inversion of the body is sometimes sufficient to cause the ejection of a foreign body, such as meat, bread, etc.

When, through the presence of a foreign body of exceeding dimensions and located beyond reach, the patient's death appears imminent, tracheotomy should be performed at once, or, if the necessary instruments are not at hand, the trachea can be opened with a penknife, and maintained so with bent hair-pins held in place by means of pieces of tape tied around the neck, until the foreign body can be withdrawn. Foreign bodies in the pharynx very rarely require such extreme measures, however. An object so situated as to endanger life must either close the laryngeal aperture by holding the epiglottis down, being then within easy reach, or so distend the œsophagus low down as to compress the trachea, which it could hardly do sufficiently to absolutely arrest the air-current. In some cases the foreign body may be pushed down to the stomach, and if not angular is usually voided *per rectum* with little or no difficulty. A one-inch screw was thus evacuated by a child three years of age, a patient of the writer.

After the removal of a foreign body there remains for a time a sensation as if it were still there, and it is sometimes difficult to persuade the patient that it has been completely removed.

DISEASES OF THE TONSILS.

Tonsillitis.

When inflammation of the tonsils, whether superficial or parenchymatous, is recognized early, guaiac seldom fails to arrest it. This drug is fairly entitled to be termed a specific in this affection, and supports through its remarkable action the close association with the rheumatic diathesis which tonsillitis seems to bear. The most effective means of employing it is in the form of the ammoniated tincture, 1 tea-spoonful in a half-glassful of milk, the mixture being employed as a gargle, then swallowed. This should be repeated every two hours at least, until the stools are noticeably increased in number or anal burning becomes marked. Lozenges containing 2 grains of the resin of guaiac may be used with advantage between the doses to keep up the local action. Salol in large doses has recently been recommended by several French writers, its effects frequently showing themselves the same day. Scarification of the inflamed tonsils, allowing the incisions to bleed freely, is another frequently successful means to arrest the attack in its incipiency. After the scarifications the tonsils should be moistened with a 10 per cent. solution of cocaine, which seems greatly to assist in bringing about an early resolution. Any sharp knife may be used for the tonsils, their location bringing them within easy reach. To avoid wounding the surrounding parts, however, it is always advisable to wrap all but about one-fourth of an inch of the point with cotton. Eight or ten stabs directed antero-posteriorly usually produce free depletion and marked relief, and frequently arrest the inflammatory process in its incipiency.

The injection of a few drops of a 10 per cent. solution of cocaine into the inflamed tonsils, by means of a hypodermic syringe armed with a long needle, is also of value in the early stages of the disease to curtail it and to diminish pain when the inflammatory process cannot be arrested.

When the case is seen late and arrest of the disease has become impossible, palliation of the suffering and efforts to bring about an early resolution should be the aim. Remedies requiring muscular effort in the inflamed parts, as deglutition, suction, etc., should be avoided as much as possible. Lozenges, for instance, by requiring frequently repeated swallowing, cause more suffering and local irritation through motion than they do good; steam atomizers produce much the same results through the accumulation of condensed steam induced, and the suction necessary to draw the steam sufficiently far. A thin spray of a solution of cocaine, 4 to 8 per cent., applied with the atomizer at short intervals, and for but a few seconds each time, keeps up the sedative action without involving mechanical irritation of the

parts. The straight tip of the atomizer is introduced between the jaws, which can usually be separated but slightly, and pushed along the surface of the tongue a couple of inches. A few compressions of the rubber ball are then sufficient to moisten the surface of the inflamed tissues. Solutions of other drugs are useless, owing to their limited local action as compared to cocaine.

When gargling is possible much benefit may be derived from water as hot as it can be borne and repeated frequently. It seems to act as an astringent, and greatly to reduce the pain. Warm flaxseed-meal poultices applied externally apparently hasten the course of the trouble, and seem to be productive of relief if renewed frequently.

Hypodermic injections of morphine and atropine, when the suffering is marked, not only reduce it greatly, but, if begun early, tend to shorten the duration of the disease. The latter feature is sometimes surprisingly demonstrated. Aconite internally, in drop doses hourly, when the fever is marked and continued until it disappears, occasionally assists local measures at the outset of the disease. The same may be said of saline purgatives.

When an abscess is formed it is always better to evacuate it than to allow it to open itself, lest it burrow into the surrounding parts and cause complications. The best means to accomplish this is to insinuate the index finger of the left hand into the mouth, and, having applied it over the seat of fluctuation, slip the point of the bistoury alongside and push it into the abscess—at times a very difficult procedure, owing to the impossibility on the part of the patient to open the mouth much more than half an inch. The patient's head should be tilted forward, so as to enable the pus to run out of the mouth, instead of into the larynx or œsophagus. Interesting in this connection is the observation by Rice of New York,[1] that when suppuration occurs in connection with tonsillitis, pus is rarely to be found in the tonsil, but may almost always be discovered in the connective tissue, either in front or behind the tonsil, the abscess being due in nearly every instance to an abnormal relation of the tonsil with the pillars of the pharynx. When no adhesion exists between an inflamed tonsil and the pillars, suppuration is not likely to ensue, while if the adhesion does exist, separation will tend to prevent the abscess. Chiari of Vienna[2] confirms these views, and suggests that in doubtful cases an exploratory puncture be made at the middle of the anterior pillar, the trocar being pushed directly backward.

Hypertrophied Tonsils.

Efforts to remove hypertrophied tonsils by means of astringents, even if the treatment is continued during a prolonged period, can hardly

[1] *Medical Record*, Jan. 31, 1891. [2] *Gazette des Hôpitaux*, May 26, 1891.

be expected to prove successful. Nitrate of silver, advocated by some writers, instead of causing a decrease in their size, rather increases the hypertrophy, owing to the tendency of this drug to encourage the formation of new tissue-elements. Ergotin, alum, tannin, etc. may have shown good results in other hands, but the writer must say that in his these remedies have proved futile. Bicarbonate of sodium, lauded by many, caused superficial irritation after prolonged usage, but failed to accomplished the desired object.

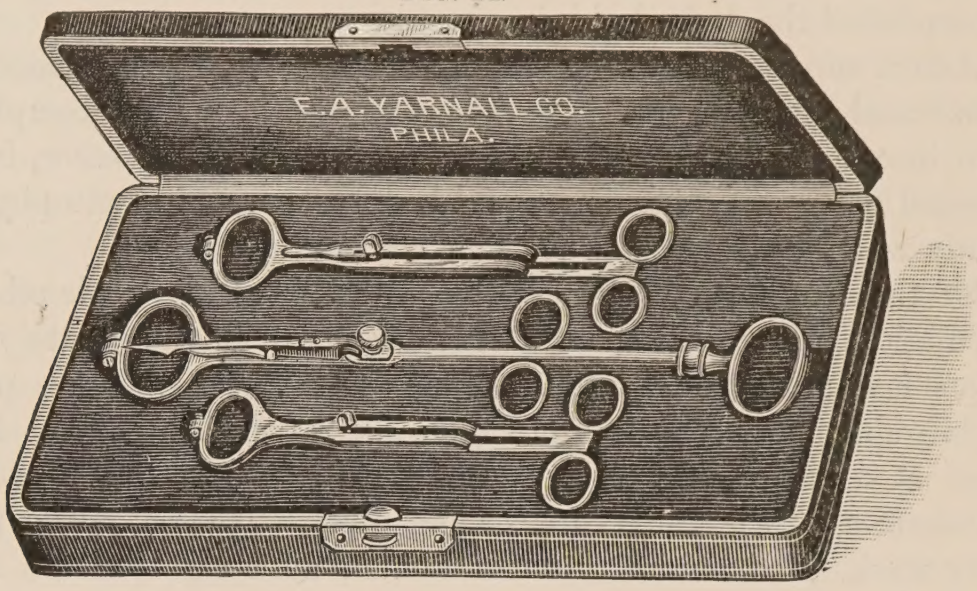
Active surgical treatment for the reduction of hypertrophied tonsils is indicated when they are sufficiently enlarged to occasion complications or to interfere with proper respiration. In adults, however, in whom enlarged tonsils are rare, there is a likelihood of gradual atrophy, which is only worth considering when they occasion no trouble.

Of the means at our disposal for the removal of tonsils other than amputation, the only two worth considering are galvano-cautery scarifications and applications of London paste. The former are practised by introducing the heated galvano-caustic point repeatedly into the tonsil at a sitting, the point being heated to a bright cherry-color. The surface is then seared three or four times. This procedure, repeated every week, produces marked contraction after eight or ten sittings. Many more are required, however, to reduce them completely. London paste, dissolved to the consistence of cream and applied with a piece of stick to the most projecting portions of the tonsil once a week, sometimes causes diminution in size of the hypertrophied tissues, but the method is so painful and tedious as hardly to merit recommendation.

Removal of the tonsils can be performed by means of the bistoury, the tonsillotome, the wire snare, and the electric snare. The operation with the bistoury can be satisfactorily employed in adults, but in children it is sometimes dangerous, owing to the resistance on the part of the patient and the consequent danger of wounding surrounding parts. An ordinary probe-pointed bistoury with a long shaft is the most convenient instrument. After thoroughly anæsthetizing the parts with a 10 per cent. solution of cocaine, the tongue is depressed by an assistant, or by the patient himself if an adult, and a volsella forceps is fastened on the tonsil with the one hand, while the other holds the bistoury. The latter is first introduced *under* the tonsil, and a couple of sweeps are made from below upward until it is cut halfway through. The instrument is then withdrawn, and placed with its cutting edge on the upper portion of the tonsil, and an incision is made from above until the first cut is reached. This frees the tonsil from its base. As generally performed—*i. e.* cutting from above downward—there is always danger of cutting the tongue, especially in nervous patients.

The operation by the tonsillotome presents none of the objectionable features of the bistoury, and can be performed without an assistant. A large number of tonsillotomes are at our disposal, best known among which is the Mathieu instrument, which raises the organ from its bed as it is being removed. The instrument shown in the cut is the writer's modification of Mathieu's tonsillotome, which introduces the feature—

FIG. 14.



one of great advantage—of adjustable rings and blades of different sizes. This makes it possible to encircle an enlarged tonsil of any size before incising it: the operation is therefore rendered much neater, and the traction and tearing accompanying the use of the Mathieu instrument are avoided.

The operation is a simple one. Cocaine anæsthesia having been obtained by local application of a 10 per cent. solution, the tongue is depressed with the left hand, and the instrument is introduced flatwise into the mouth until the ring is on a level with the tonsil. A quarter turn of the instrument on its axis will bring the ring over the tonsil, against which it is then gently pressed. The fingers and thumb-rings being then approximated, the tonsil is perforated and cut off. The pain is very slight, as a rule, and the profuse bleeding that takes place usually stops in a few moments. Very rarely profuse hæmorrhage occurs. In two cases the writer has seen an alarming flow, which recurred seven times in one of them, and was stopped with great difficulty in each instance. This case and the few fatal cases found in the literature of tonsillar operations have caused him to look upon this danger as usually underrated. It is always well to place a drachm or two of tannic acid in the hands of the patient, and to show him how to use it should hæmorrhage recur. He can easily apply it with the end of the finger by slightly moistening the latter, dipping it into the powder, then applying its palmar surface to the bleeding spot.

Amputation with the snare is a rather slow process, fifteen minutes at least being required. The galvano-caustic snare makes it possible to finish the operation much more rapidly, and presents the great advantage of markedly limiting hæmorrhage.

Occasionally the enlarged tonsil is found adhering to the sides of the pillars with which it is in contact. It should be detached before the operation by inserting the blunt point of a probe between pillar and tonsil at the points of contact.

The after-treatment is of little importance, the cut surfaces usually healing in a few days without requiring the slightest attention or producing general manifestations. It is always well, however, to advise the patient to use soft food for two or three days, and to avoid highly-seasoned or hot liquids.

Scarification with the galvano-cautery knife is a less heroic, but slower, method of reducing enlarged tonsils. Deep transverse incisions, four or five at a time, into each tonsil, repeated in four days if possible, soon show marked effect. The galvano-cautery point may also be used to penetrate the enlarged organ and cause its contraction ; scarification, however, is not only easier to perform, but more effective.

DISEASES OF THE LARYNX.

Subacute Laryngitis.

This form of laryngitis is the most frequently met with. In ordinary life its predominant symptom, hoarseness, is of little importance ; in professions in which the voice takes the all-important part—singers, actors, ministers, etc.—however, its successful treatment becomes necessary to livelihood, and should therefore be based on a close study of each individual case. In these cases also the necessity of preserving the integrity of the tissues by avoiding the use of any concentrated agents —nitrate of silver, acids, etc.—that may impair the purity of the voice should be borne in mind.

Among the local causes of the mildest form to be considered is perverted lubrication, especially of the vocal bands proper. Smoke and the prolonged inhalation of dust are prolific causes of this dryness, which determines an inflammatory process of greater or less intensity.

The therapeusis of this condition consists in the use of a warm spray, every two hours, of a saturated solution of potassium chlorate, and 10 grains of ammonium muriate in a tumblerful of water at the same intervals. The last dose should be taken at least three hours before the performance, sermon, etc., to avoid exposure during the stage of perspira-

tion which follows the active administration of the remedy. A lozenge containing 2 grains of ammonium muriate is very valuable in maintaining the effect produced.

Most frequent among the causes of subacute laryngitis are those due to the presence of catarrhal changes of a chronic character in neighboring cavities, especially the nose, naso-pharynx, pharynx, and tonsils. This origin is sufficiently frequent, in fact, to cause a few writers to ascribe every case to some nasal trouble. The intimate anatomical relation between all parts concerned renders it quite certain that whenever a chronic nasal or pharyngeal affection exists, the least exposure to any exciting cause will induce an extension of the inflammatory process to the larynx by continuity of tissue, the predilection of the vocal organ proper in this connection being easily explained by the constant use to which it is subjected. But that this inflammatory process cannot develop without nasal or pharyngeal catarrh as a *prima facies* appears to the writer illogical. The fact, however, that nasal catarrh is present in the majority of the cases we are called upon to treat makes it imperative that we should examine the nasal and pharyngeal cavities in every case, and that with considerable care, for the reason that an almost imperceptible though very active focus of irritation may be found here. Lesions of the anterior nasal cavities are not so apt to cause hoarseness as those of the naso-pharynx or pharynx proper, probably because of the greater remoteness of the parts and the fact that the secretions are apt to be voided anteriorly.

The first question to be considered is that of rest. As a general rule, this is indicated in every case, whether mild or severe; for, as Michel of Cologne states,[1] alluding to vocalists: "Singers who use their voice during a more or less grave disorder almost always cause it to lose some of its brilliant qualities." That this is true there is no doubt, and our recommendation should be framed accordingly, taking the severity of the local trouble as our guide, as regards the duration of the resting period and its degree. In professional singers and speakers, however, rest is rarely possible, and as long as a vestige of voice remains they insist upon a continuance of their work. What are we to do in these cases? Without doubt the most advantageous plan to all concerned is frankly to disclose to the patient the dangers incurred; to recommend abandonment of rehearsals, limitation to the smallest degree possible of the part to be sung or spoken; to transpose, when possible, all high notes, or, if this is not possible, to shorten the chest register a couple of tones, thus changing to the head tones without having to throw upon the larynx the strain of the two highest notes of the chest register; in other words, to limit as much as practicable the work of the vocal apparatus.

[1] *Revue de Laryngologie, d'Otologie, etc.*, March 15, 1889.

A general point of importance in the treatment of these cases is one frequently overlooked—attention to intestinal action. In female singers especially constipation is almost the rule, due, probably, to the irregular attention they can give themselves, their varying diet, and the continued travelling in railroad cars, the last being a very active agent.

Purgatives are very useful, but in singers and public speakers even mild aperients are, for obvious reasons, out of the question. Enemata, while being immediately effective, present the advantage of not diminishing the patient's strength. An enema composed of 1 pint of lukewarm water and a table-spoonful of glycerin will sometimes be found to act surprisingly, not only on the intestines, but on the voice, especially if, as is often the case with travelling artists, the bowels have not been moved for several days. Important also in this connection is the influence of the gastric and hepatic organs in maintaining the catarrhal affection which induces the hoarseness, and to which singers who indulge themselves rather freely are specially liable. An emetic, followed every two hours until the performance by 10-grain doses of bismuth, acts most promptly in these cases.

Taking now the treatment of the catarrhal disorders of the nasopharynx in the order in which they were described, we will first consider coryza involving the nose proper and the vault. The turgescence of the erectile tissues of the anterior cavity should first be reduced by a local application with a pledget of cotton of a 4 per cent. solution of cocaine. This accomplished, a powder composed of $\frac{1}{8}$ grain of morphine acetate, 1 grain of bismuth subnitrate, and 1 grain of sodium salicylate is blown into each nostril, taking care to project the powder sufficiently far to include the pharyngeal vault. The walls of the cavities being thus well covered with the sedative powder, a fine spray of liquid cosmoline is thrown over the whole. The procedure should be repeated in four hours if possible. If fever is present, drop doses hourly of tincture of aconite will usually reduce it markedly and favorably influence the catarrhal process.

If the nasal trouble be but an exacerbation of a chronic rhinitis, masses of secretion are often the principal cause of irritation. Their removal by means of a coarse spray of a solution of 5 grains of bicarbonate of sodium to the ounce of water assists the other portion of the treatment. When an attack of coryza is of several days' duration more active means are necessary to bring about an immediate and lasting cessation of at least the occlusion of the nose. An incision with a small galvano-cautery knife into the most prominent swellings over the turbinated bodies of one side is of service. The most satisfactory local application to the pharynx in an exacerbation of simple or follicular pharyngitis is a solution of nitrate of silver, 40 grains to the ounce. A

solution of this strength acts to a degree as an anæsthetic by causing contraction of the capillaries. It should be applied with a cotton pledget, after thorough cleansing of the surface with a spray of the bicarbonate-of-sodium solution mentioned. Care should be taken to allow none of the solution to fall into the laryngeal cavity. Inflamed follicles, if painful, should be cauterized lightly with a galvano-cautery point, not more than three or four, however, being destroyed at one sitting. The counter-irritation produced by cauterization frequently clears the voice markedly, especially for the evening of the day on which it is performed. As far as the treatment of the larynx proper is concerned, the writer cannot say that in his hands the ordinary carbolized sprays, Dobell's solution, etc., have given the results claimed by many; in a number of cases, in fact, they seemed to act more as irritants than sedatives. When there is considerable adhesive secretion in the larynx, however, they become useful as cleansing agents. Much more effective in reducing the hyperæmia, and therefore the turgid condition of the capillaries of the vocal bands, is a solution of resorcin, 7 grains to the ounce. A stronger solution causes too much dryness; a much weaker one is ineffectual. The preparation should be used with an atomizer about every two hours the first day, then three times daily. To enable the solution to bathe the bands thoroughly the voice should be sounded *during inhalation*, while the fluid is being sprayed in, the bands being thus brought in and forming a floor, as it were, at the lowest portion of the larynx. When the hoarseness is great an application with the cotton pledget of carbolized iodo-tannin or a solution of perchloride of iron, 20 grains to the ounce, causes a sudden contraction of the capillaries, which is effectively maintained by the resorcin solution.

When the case is a recent one and is seen early in the day, an insufflation of the powder recommended for the nose (morphine acetate $\frac{1}{8}$ grain, bismuth subnitrate 1 grain, and salicylate of sodium 1 grain), repeated in two or three hours, will sometimes succeed in aborting it, especially if the powder is well distributed over the laryngeal surfaces, and if a fine spray of liquid cosmoline is thrown over the powder. A thin coating is thus formed over the inflamed membrane, which protects it for some time against the irritating action of the air-current. Morphine has a "benumbing" action on the vocal bands, and should not be used within four hours before singing or preaching.

Of great assistance in this class of cases, as well as in the muscular variety, next to be considered, is the use of "vin Mariani" when taken not only a half hour before the performance, but at the end of each act, so as to get the benefit of "toning" action when the next act is about to begin.

Hoarseness of myopathic origin is most frequently recognized in

women, possibly because their larynges do not as frequently as in men present the permanent hyperæmia of the bands which renders a positive diagnosis almost impossible. The larynx shows but little, if any, alteration from the normal. This, of course, does not apply to paralytic or even true paretic cases, in which characteristic appearances would be present, but to atony of the muscles. The speaking voice is normal. The singing voice is generally alone affected, and that only in certain tones, though weakness pervades them all. The higher tones are generally "lost in the breath;" that is to say, the passage of the air through the glottis is much more audible than the note proper, although in a small proportion of the cases the upper portion of the chest register may alone be affected.

The treatment of this condition differs in every particular except one from that of the preceding condition. The exception is the attention to be paid to the gastro-intestinal system, which may be found to be an important element in a small proportion of cases. In emergency cases the voice is sometimes markedly improved by a mild faradic current, the positive pole being applied behind the larynx, below the inter-arytenoid notch, and the negative externally on each side of the thyroid cartilage. The point of the laryngeal electrode should be flattened from before backward and covered with chamois skin. For an external electrode the writer usually uses the thumb and index finger of his left hand, the end of the battery cord being fastened to the palm. In this manner he can make the application with much more exactness over the location of the muscles he desires to influence on each side of the glottis, penetration being secured by frequently dipping his fingers in water. The crico-thyroid and crico-arytenoid are first treated by placing the fingers on each side of the space felt below the thyroid cartilage, and sliding them antero-posteriorly along the groove felt in the deep tissues, the skin which slides over the latter with the fingers being pinched when they are approximated anteriorly. To treat the thyro-arytenoid the fingers are merely moved a quarter of an inch higher (just below the lower border of the thyroid), and the same procedure gone through with. The length of the application depends entirely on the ability of the patient to stand the electrode in the larynx. It is generally well tolerated, owing to the fact that it does not enter the laryngeal cavity. Five minutes represent the usual time occupied in such cases. The electrode is introduced a few seconds, then withdrawn, then reintroduced, and so on, great care being taken to avoid touching the base of the tongue. A solution of hydrochlorate of cocaine can be used to anæsthetize the spot upon which the electrode is to be placed, but the pernicious after-effect of this drug on the voice when the latter is to be used within a few hours renders the drug undesirable.

Internally, a pill composed of quinine sulphate 1 grain and extract of nux vomica ¼ grain, administered every two hours, maintains the muscular tonicity throughout the performance, especially when Mariani coca wine is taken between the acts, as previously recommended. The curative treatment includes the electrical application three times a week, and iodide of potassium 5 grains, gradually increased to 30, three times daily if the patient can bear it, which he will be much more likely to do if it is administered in a glassful of water immediately after meals, and if 3 drops of Fowler's solution are given with each dose.

In cases characterized by severe congestion the patient should remain at home and avoid as much as possible atmospheric transitions, such as going from one room to another of a different temperature, sitting by an open window, etc. He should also avoid smoking or the inhalation of air contaminated with smoke, and alcoholic beverages.

A sharp attack of subacute laryngitis can frequently be cut short by a derivative purgative, castor oil, calomel, and colocynth being effective in the order named. Although a popular remedy, castor oil still holds its own as a derivative for laryngeal affections, and is far from meriting the obsolete position it is occasionally given. One-drop doses of the tincture of aconite-root every hour should be administered at the same time, the pulse being closely watched to prevent undue action.

A less unpleasant method of arresting an attack in the early stages is to apply a 10-grain solution of cocaine to the larynx every half hour,[1] either with the atomizer or by means of a laryngeal brush, Mariani wine of coca, a sherry-glassful every two hours, being given internally. This method is especially valuable when the patient is unable to remain at home, the anæsthesia of the larynx produced by the coca preparations greatly limiting its sensitiveness to external influences. If an idiosyncrasy against cocaine exists, a solution of resorcin (10 grains to the ounce) may be substituted as a local remedy.

Benzoin is sometimes very efficient in these cases. A tea-spoonful

[1] The writer has not as yet encountered a case in which hydrochlorate of cocaine, when employed as indicated, was followed with deleterious effects. The fact that alkaloids in the form of crystals are usually purer than the same alkaloids that are granular in shape *may* on general principles furnish a reason for this, the crystalline alkaloid alone being employed by the writer. He employs a preliminary test to ascertain whether there is an idiosyncrasy in the patient—applying a small quantity of the solution with a cotton pledget and waiting a few minutes—but has not as yet encountered a subject in which the susceptibility to the drug was present. A prominent physician under the writer's care, who, on his own responsibility and against the latter's wish, used a quantity of solution representing at least 10 grains of the alkaloid within an hour, was the only case ever observed in which temporary discomfort ensued.

of the tincture being placed in a tea-cupful of boiling water, the cup is covered with a towel folded in the shape of cone, a hole being left at the apex. The nose and mouth being inserted into this hole, the medicated steam is inhaled as long as it is evolved.

Acute Laryngitis.

This form of laryngitis being characterized by intense inflammation involving the submucous tissue, energetic and prompt measures are of prime necessity. The first step is to ascertain the degree of infiltration by means of the laryngoscope. The respiration should not be taken as a criterion, as the œdema in the upper part of the larynx may be quite severe at first, without presenting much obstruction to the passage of air, and suddenly kill the patient by closing the laryngeal aperture unexpectedly. If the infiltration is limited, a general derivative treatment may be of service. A hot mustard foot-bath, followed by free diaphoresis, avoiding at the same time all drinks, may prove very beneficial by drawing blood to the periphery and diminishing local pressure. Tincture of belladonna, 5 drops every hour until its physiological effects become marked, also tends to counteract the infiltration by contracting the laryngeal blood-vessels.

Local applications in the form of powders, or solutions requiring the use of the brush or the cotton pledget, are inadvisable, the mechanical irritation doing more harm than the agent applied does good. A fine spray is the least irritating medium, and a 10 per cent. solution of cocaine the most effective agent if the cocaine employed is of a good quality. The depletion occasioned by the contraction of the blood-vessels must, however, be maintained, and the atomizer should consequently be used about every twenty minutes until the acute symptoms have disappeared. The writer generally employs a mixture composed of one-half of a 20 per cent. solution of cocaine and one-half listerine. The antiseptic action of the latter adds greatly to the detergent effect of the mixture, and renders it less liable to undergo alteration. In cases in which infiltration is not present, and the intense congestion causes this complication to be merely feared, a spray of resorcin, 10 grains to the ounce, is often sufficient to reduce the inflammatory symptoms.

When œdema is unmistakably present, surgical measures become necessary. The swelling must be scarified and relieved of at least a portion of its contents—a procedure rendered easy by the use of the laryngeal mirror. The ordinary pocket-case bistoury may serve the purpose efficiently, its blade being surrounded by cotton wadding to within a quarter of an inch of the point, to prevent cutting of the parts anterior to the larynx. The tongue being drawn out, the epiglottis will generally be seen standing erect and swollen. The mirror being

introduced, the knife is passed around the side of the epiglottis, and its point is pressed into the external border of the ary-epiglottic fold, thus causing the blood and serum to flow into the pyriform sinus instead of the laryngeal cavity. The other side of the larynx should be treated in the same manner if possible. There are many special lancets for the purpose, but as they are seldom at hand just at the time needed, dependence had better not be placed on them. The relief is usually immediate, and a repetition of the procedure is seldom necessary.

In some cases the symptoms are so urgent as to preclude even scarification from the safe resources. Unless a set of intubation instruments be at hand, and intubation can be resorted to without hesitation, rapid tracheotomy must be performed to save the case.

Convalescence from an attack of acute laryngitis is usually quite slow, the voice remaining husky for some time, while recurrence of the acute symptoms under exposure is by no means a remote possibility. This of course suggests great care for at least a month after the attack, not only as far as atmospheric surroundings are concerned, but also as regards diet, which should be of an unirritating character. Astringent sprays—alum, sulphate of zinc, or resorcin, 5 grains to the ounce—tend to encourage resolution.

Suarez de Mendoza[1] recently recalled the fact that pilocarpine, injected hypodermically, proves very efficacious in reducing laryngeal œdema. Six drops of a 5 per cent. solution of the alkaloid, repeated three times at intervals of fifteen minutes, caused complete relief in the cases reported.

Secondary Œdema of the Larynx.

Œdema occurring as a secondary manifestation of a general disease is of course more prone to recurrence than the inflammatory form just described. A primary affection, whether renal, cardiac, or hepatic, forming the cause of obstruction, the laryngeal œdema fluctuates with its clinical variations. This form of œdema presents itself without inflammatory manifestations, and local applications, derivatives, and even depletory measures, with the exception of saline purgatives, which may not be indicated in the treatment of the original affection, are of doubtful value. The only resource is scarification, in the manner described under the last heading. The incisions should be free, and as much serum as possible evacuated. If the scarifications do not relieve the dyspnœa, subglottic œdema is in all probability present, and tracheotomy is the only resource.

It might be well to mention in this connection that the administration of iodide of potassium is a dangerous measure when œdema of the larynx forms a complication of any disorder.

[1] *Revue de Laryngol.*, Aug. 15, 1891.

Perichondritis and Chondritis of the Larynx.

All the diathetic processes characterized by ulceration of the laryngeal mucous membrane and many of the acquired affections involving the larynx may give rise to inflammation of its cartilages and their covering, the perichondrium. Thus, syphilis, tuberculosis, cancer, erysipelas, gout, measles, typhoid-fever, typhus, variola, blennorrhagia, etc. may be the cause. The fact that its initial symptoms, objective and subjective, are very insidious, make an early diagnosis rarely possible. When pain, usually the first symptom, is present, accompanied with localized redness and swelling, a strong solution of cocaine, applied with a cotton pledget, does much to reduce it and to assist any tendency to resolution. When an abscess becomes evident, an aspirator may be used to empty it of its contents, a long, thin, curved trocar, passed through a universal mirror-handle, serving the purpose after thoroughly anæsthetizing the larynx with cocaine. This procedure avoids the necessity for the preliminary tracheotomy which is always indicated when an incision is required to withdraw necrosed cartilage or thick pus. The trachea in these cases must be opened low down, to avoid any proximity to the inflammatory process. The general treatment is of course that of the primary affection.

Chronic Laryngitis.

The association so frequently noticed between chronic inflammation of the naso-pharynx and of the larynx renders it imperative always to examine the entire upper respiratory tract when continued hoarseness is complained of. This is further supported by the fact that cases are often met with in which no benefit whatever is derived from treatment limited to the larynx until attention is given to the naso-pharyngeal surfaces. Cleanliness of these parts, in fact, may be considered a *sine quâ non* of success in 90 per cent. of cases. The characteristic congestion of this affection, and even the superficial erosions frequently encountered, will in the majority of cases yield to a detergent spray of bicarbonate of sodium, borate of sodium, and salicylate of sodium, 3 grains of each to the ounce of water, applied copiously three times a day to the entire upper respiratory tract—the nose, the pharynx, and the larynx. This, of course, applies to cases in which any nasal or pharyngeal affection that may have existed has been thoroughly treated.

Local treatment after cleansing is also most efficient when carried out by means of the atomizer, the cotton pledget being only used to touch the erosions with stronger agents. Resorcin is an effective agent in a solution containing 7 grains to the ounce. A 20-grain solution of

iodoform in benzoinol is a very effective remedy, but the difficulty of keeping the atomizer free when benzoinol is used renders its employment obnoxious to the patient, to say nothing of the unpleasant odor of the iodoform. Iodol might be substituted, but it possesses irritating properties when used in strong solutions: 5 grains to the ounce is the maximum strength that an inflamed larynx can stand with benefit. Solutions of sulphate of zinc, sulphate of copper, and alum, 5 grains to the ounce, may be substituted should the other agents recommended not be obtainable.

The dark-red or bluish patches and erosions occasionally observed need special treatment—one, it must be said, in which the practitioner's dexterity will be taxed quite severely. Each spot must be touched with a 60-grain solution of nitrate of silver, a small cotton pledget securely held in a laryngeal forceps being used. Care must be taken that the cotton be not too greatly loaded with the fluid, lest compression in the larynx cause the solution to drip into the trachea. Before cocaine was introduced spasm of the larynx was to be feared in such applications. A preliminary application of a 20-grain solution of cocaine will, however, prevent this complication if at least four minutes elapse between the application of the anæsthetic and the astringent. The applications should be repeated every other day. Chloride of zinc, 10 grains to the ounce, may be used in the same manner if fear of using nitrate of silver be entertained; but the case will drag on much longer.

In certain cases the vocal bands will present, during an exacerbation of the catarrhal process, the greatest amount of congestion as compared with other parts of the laryngeal cavity. Their mucous membrane appears thickened, bosselated, and very red at the edge, the voice being coarse and screechy when an effort to sing is made. This form of chronic laryngitis is characterized by frequent exacerbations, and finally costs a singer his voice unless he stops singing for a while and undergoes active local treatment. Labus of Milan[1] proposed flaying of the vocal bands in these cases, and obtained several satisfactory results. After thoroughly anæsthetizing the larynx he tore off with a sharp square-tipped laryngeal forceps the superficial layer of membrane of the vocal bands—a procedure followed by slight hæmorrhage, a few days' aphonia, and final recovery of the voice. The writer[2] substituted applications of chromic acid to destroy the thickened mucous layer, obtaining equally satisfactory results. Cocaine causing a copious flow of lubricating fluid from the lateral tissues when applied to the larynx[3] for a certain length of time, it is necessary to use the acid as soon as possible after

[1] *Archives of Laryngology*, volume of 1880.

[2] *Transactions American Laryngological Association*, session of 1888.

[3] See writer's observations, *Ibid.*, p. 124.

the application of the 25 per cent. solution, the strength it is advisable to employ. The chromic acid, fused by heat to the end of a covered probe, such as MacCoy's, immediately before the anæsthetic, is then applied to the surface of one of the vocal bands, while the patient, having been told to make a sound, brings both bands into apposition. This enables the operator to avoid cauterization of their edges—an important point in the preservation of the voice, especially in women. But little if any disturbance follows, and after a few days hardly a trace remains of the cauterization, except a spot presenting less redness than the surrounding parts. The applications should be made twice a week until all traces of localized congestion or bosselated areas have disappeared.

Chronic laryngitis is sometimes aggravated by gastric, hepatic, or intestinal disorder, especially in drinkers and smokers. Attention to these conditions should of course form an important part of the treatment in such cases. In excessive smokers the congestion is often maintained simply by the irritating action of the air contaminated with smoke. Sitting in a smoking-car or in a room in which others are smoking is therefore as bad as if the patient himself were smoking.

Dry Laryngitis.

This affection, generally termed laryngitis sicca, corresponds with the affection previously described under the name of dry pharyngitis, and occurs in the great majority of cases as a result of the latter affection. The lubricating fluids of the larynx being greatly reduced, muco-purulent masses are formed which adhere to the membrane and add greatly to the inflammatory process.

Attention to the naso-pharyngeal disorder forms an important part of the treatment. Detergent and disinfecting sprays are of great use, but must be employed for a considerable time. Chlorate of potassium in the form of a saturated solution, and permanganate of potassium, 3 grains to the ounce, are the most effective agents, while listerine and water, equal parts, may also be recommended, to alternate with either. Iodide of potassium, administered internally, 5 grains three times a day in half a glassful of water, tends to increase the laryngeal secretions, as it does those of the nasal cavities, especially in persons who are sensitive to its physiological effects.

Tuberculous Laryngitis.

Although the treatment of this affection is seldom followed by complete recovery, the proportion of cases resulting favorably is gradually increasing. Bosworth [1] recommended some years ago a course of treatment which at least did much to demonstrate the importance of a

[1] *Diseases of the Throat and Nose*, New York, 1881.

systematic line of procedure in not only retarding the progress of the local trouble, but in some cases causing its disappearance. Absolute local cleanliness, maintained by means of detergent sprays, is the first indication. A solution of borax in rose-water, 5 grains to the ounce, is used by the writer for this purpose, a coarse atomizer, such as Sass's, being employed. The larynx being thoroughly cleansed, an anodyne is next in order. Cocaine in this condition is certainly of the greatest value, and, gently applied with a cotton pledget held in a laryngeal forceps, it arrests the suffering almost at once, and enables the patient to enjoy at least a couple of hours' respite, which he can take advantage of to take food. The effect can be maintained by a spray of a 4 per cent. solution, used by the patient himself. Lozenges might be used advantageously were the swallowing accompanying their use not pernicious as a mechanical irritant. Insufflations of morphine might also prove advantageous did not the secondary dryness of the throat characterizing the use of this drug preclude its continued use. In some cases, however, these pernicious effects do not obtain, and much assistance may be derived from the use of both cocaine lozenges and morphine powders, the latter being best applied finely triturated and in doses varying from $\frac{1}{8}$ to $\frac{1}{4}$ grain with an insufflator.

In the same manner iodoform may be used, for it is valuable in all ulcerations of mucous membranes, and often efficacious in the larynx when the ulcerations are shallow. The quantity applied should be sufficient to cover the entire laryngeal surfaces with a thin film, and be renewed daily at least, twice a day being preferable. A less disagreeable way to apply the remedy is that suggested by the late Dr. Elsberg of New York—*i. e.* dissolving the drug in ether to saturation. This solution may conveniently be used with the atomizer by the patient, and can therefore be applied frequently. The ether produces a temporary local anæsthesia, which is very grateful to the patient, and the unpleasant odor of the iodoform is masked by it to a great degree.

When superficial erosions and ulcerations do not yield to these measures they seldom show any tendency to submit to the influence of astringents—nitrate of silver, in solution of various strengths; tannin, 10 grains to the ounce; or sulphate of zinc, 10 grains to the ounce, which are next in order.

A valuable remedy is that proposed by Krause[1]—namely, lactic acid. To obtain the best results with this agent the larynx should be thoroughly anæsthetized with a 25 per cent. solution of cocaine. Two or three of the spots of ulceration are then selected for the acid application, and a small sharp curette is employed to scrape them, all hæmorrhage being prevented by the cocaine. It is perhaps needless to state that the laryngeal mirror must invariably be used. This done,

[1] *Revue mensuelle de Laryngologie*, Nov., 1886.

the scraped ulcers are as much as possible dried with absorbent cotton, and a 20 per cent. solution of lactic acid having been prepared, it is applied by means of a small pledget of cotton held in a laryngeal forceps to each of the two or three spots of ulceration selected. The cotton pledget moistened with the acid solution should be kept in contact with the ulcer two seconds if possible. In some cases considerable irritation ensues; in others almost none is noticed. The applications should be repeated every day, the strength of the solution being gradually increased by 10 per cent. at intervals of two or three days, according to the degree of irritation excited. Rosenberg's method of injecting a 20 per cent. solution of menthol in olive oil finds many supporters. Thirty minims can be dropped over the laryngeal surfaces without, it is said, producing discomfort.[1]

Tracheotomy is advocated by writers of the eminence of Beverly Robinson and Moritz Schmidt, with a view to give the diseased larynx perfect rest, to deviate from it the passage of irritating air, and to better respiration. Schmidt[2] reported good results in eight cases, and arrived at the following conclusions: 1. If there is stenosis, the operation should not be delayed. 2. It is indicated where the laryngeal disease is marked, but where the lungs are comparatively healthy. 3. Also in rapidly-advancing laryngeal disease before dyspnœa supervenes. 4. And, above all, if dysphagia is present.

Of importance is the attention to diet, which should be nutritious though unirritating. Cream is swallowed with more ease than milk, owing to its greater specific gravity, and pap-like dishes than soups, for the same reason. Rare meat finely hashed is readily swallowed, especially if mixed with an egg. Oysters are also taken without trouble, provided they are not too salt. Raw eggs can generally be swallowed with ease. In a word, extremes must be avoided; the food must not be hard nor absolutely liquid; it must not be too highly seasoned, nor should it be too bland, else there will be a distaste for food. Leaning over anteriorly while eating causes the food to pass down along the pyriform sinuses, thus avoiding the upper portion of the larynx, contact with which causes the severe pain experienced by advanced cases during the act of deglutition. This suggestion was obtained from that of Norris Wolfenden of London, who advises that the patient lie face downward on a lounge, with his head hanging over the lower end, and thus draw into his mouth by means of a rubber tube any liquid from a tumbler placed on the floor.

The favorable location of the larynx as regards elimination of detached products, etc. renders it exceedingly suitable for treatment with

[1] Cozzolino, *Rivista de los Hospitales*, No. 29, 1891; J. Walker Downie, *Brit. Med. Journ.*, Apr., 1891.

[2] *The Throat and its Diseases*, Lennox Browne, London. 1890, p. 394.

Koch's tuberculin. Indeed, this remedy, though by no means entitled to be classed as a specific, is nevertheless worthy of being considered, in the light of our present knowledge, the most potent agent yet produced. In the lungs the elimination of necrobic eschars is one of the great drawbacks of the method, the remedy becoming in this sense a source of serious danger. In the larynx, where the evolution of the curative process may be observed with freedom, the more or less intense localized redness following the injection of the remedy, the occasional circumscribed œdema rarely requires active intervention. Local transformation of active lesions into foreign bodies, which when ejected leave in their place an ulcerated, red, and granular surface, which heals sooner or later, etc., follow the injections of tuberculin without interference and without involving the *sui-generis* secondary manifestations that the same process in the lungs is more than likely to produce, especially when extensive lesions are present. This is so true that in some cases of laryngeal and pulmonary phthisis the laryngeal lesions completely disappeared and were considered as cured, while little or no benefit could be observed in the lungs.

In cases of primary laryngeal phthisis, complicated with few or no pulmonary manifestations, a number of cures have been reported in the enormous literature of the subject. What "cure" means with so dangerous a remedy remains to be seen. The possibility of acute universal phthisis, as expressed by Virchow, can doubtless be read between the lines of many of the cases reported, while those reported as favorably influenced have not as yet had time to show their *final* termination. The opinion is rapidly gaining ground that want of success may be ascribed in a large number of the cases reported to excessive and too rapidly increased injections made, the tendency having been to seek reaction instead of therapeusis. This is doubtless a wholesome trend of opinion, and one that may lead to the recognition of the limit of toxicity possessed by the remedy. Moritz Schmidt at the Congress of Internal Medicine of Wiesbaden[1] stated that he regulated the treatment according to the cause of the affection. He injects $\frac{1}{2}$ milligramme as a first dose, 1 milligramme during the first month, 2 milligrammes the second month, etc., the injections being made every four or eight days according to the local and general reaction. This course offers less risk, without in any way decreasing the chances of success, and is to be recommended in every way. It goes without saying that the vital forces of the patient should be carefully supported by appropriate diet.

Syphilitic Laryngitis.

The proclivity of the upper respiratory tract to become the seat of

[1] *Revue internat. d. Laryngologie,* July and Aug., 1891.

secondary and tertiary manifestations of syphilis probably depends in a great measure upon the frequent presence in this locality of catarrhal disorders which weaken its resisting powers. This should be borne in mind in the treatment, and detergent washes ordered, not only for the laryngeal surfaces, but for the nasal and pharyngeal cavities, when any indication of a catarrhal congestion is detected. In secondary lesions these are usually quite sufficient as local measures, and the tendency to spontaneous resolution which characterizes such lesions is greatly enhanced. If the mucous patches seem stubborn, a 60-grain solution of nitrate of silver, applied with a very small cotton pledget to each spot after partially anæsthetizing the larynx with a 10 per cent. solution of cocaine, will soon cause them to disappear. As a cleansing agent a solution of bicarbonate of sodium, borate of sodium, and salicylic acid, 3 grains of each to the ounce of water, may be used with advantage.

In secondary manifestations, when the diagnosis is rendered positive by the mucous patches and other evidences, a mercurial treatment is indicated to prevent, if possible, the appearance of tertiary syphilis. The red iodide of mercury has withstood the test of time, and is still, in the writer's opinion, the most satisfactory preparation to fulfil this purpose. As recently tabulated by Mahé,[1] "1. It is a stable compound, permitting absolute accuracy in dosage. 2. It is as powerful a tonic as any mercurial preparation. 3. It is nearly twice as effective as a germicide. 4. The quantity of mercury exhibited can be reduced to a minimum, the dose being small. 5. It is not decomposed by, nor does it interfere with the simultaneous administration of, iodide of potassium when such a combination is necessary. 6. There is no danger of poisoning a patient by the possible change into other substances." The preparation should be administered in doses of $\frac{1}{16}$ grain three times daily, and alternated, if ptyalism occurs, with iodide of potassium, 10 grains night and morning. After six weeks' or two months' steady treatment a rest of two or three weeks should be given, and Rabuteau's pills of carbonate of iron administered, one after each meal, if any indication of anæmia be present. The mercurial should then be renewed, withdrawn, and again renewed, according to the indications of the case, which should remain under treatment at least one year.

When the tertiary manifestations are present, the system must, as soon as possible, be brought under the influence of antisyphilitic treatment, to check in the briefest time possible the ulcerative process. Mercurial inunctions, a piece of mercurial ointment the size of a cherry rubbed into a different part of the body three times daily, show their influence in a few days, when they may be reduced to two a day.

[1] *Annual of the Universal Med. Sciences*, sect. M, p. 25, series 1890.

When the gums show evidences of beginning ptyalism the mercury had better be replaced by iodide of potassium, beginning with 10 grains three times daily, and increasing at the rate of 1 grain per day, until 30 grains are administered three times a day. While iodide of potassium is being used the urine must be closely watched, and if it becomes scanty or its specific gravity becomes abnormally increased, prudence must be exercised lest œdema of the glottis occur. The larynx should be frequently examined, and if any indication whatever of œdema appears the drug must be decreased or temporarily withheld, as the case may be. Œdema rarely occurs, however, and when the maximum dose has been reached, it can generally be continued for a long time, and then gradually decreased as it was increased. To prevent gastric disturbances, the iodide should be administered in a tumblerful of pure water after meals. Should its physiological effects become manifest, the administration of Fowler's solution, 3 drops, with each dose, gradually increased, will effectually overcome them and act as a tonic.

The local treatment is of importance, not only to assist the healing process, but to diminish suffering. The detergent spray already mentioned can be used advantageously to detach the layers of pus which cover not only the ulcerations, but the adjoining parts. When they have been thoroughly cleansed, a 10 per cent. spray of cocaine should be employed to anæsthetize the parts prior to the application, by means of a small cotton pledget held in the laryngeal forceps, of a solution of nitrate of silver, 120 grains to the ounce. This preparation is preferable to the pure crystal, which tends to encourage cicatricial contraction of the parts touched. Only the ulcerations should be touched with solution, the laryngoscope being of course necessary to render the manipulation accurate. Insufflations of iodoform may be substituted by those who find the preferable method too difficult.

When extensive ulcerations are present, cicatrization and secondary contraction are hardly avoidable, the adhesions formed being occasionally of such a nature as to render tracheotomy and the permanent wearing of a tube necessary. Frequent dilatation with a curved probe during the stage of formation will do much to limit the contraction, while the laryngeal bistoury may be used with advantage to sever any web that may be reached. The patient should be occasionally examined after recovery, the process of cicatrization sometimes requiring years to attain the maximum of its development.

In cases of cicatricial stenosis cutting dilators—Stoerk's, Whistler's, or Lennox Browne's—become necessary. The first two instruments require preliminary tracheotomy, their olive-shaped tips occluding forcibly the aperture left by the cicatricial bands. Browne's instrument, however, does not require preliminary tracheotomy, its tube-shaped shaft

serving as a passage for air. The larynx should be anæsthetized with a 20 per cent. solution of cocaine, thereby enabling the operator to use more force in passing the olive tip of the instrument through the laryngeal aperture before and after the incision made by the hidden knife which it contains. This operation, it must be said, is not always satisfactory; neither is that of intubation with a stationary tube.

Erysipelas of the Larynx.

Although erysipelas of the larynx usually occurs as a complication or continuation of the same process in neighboring parts, it may be primary in a small proportion of cases. In either case the presence of erysipelas in this locality is accompanied with much danger to life, not only through the local complications, such as œdema, which may come on without warning, but on account of general disorders caused by the disease—pneumonia, pulmonary œdema, heart failure, general toxæmia, and cerebral adynamia. For this reason internal medication calculated to offset the tendency to grave complications should at once be begun. Alkalines, such as chlorate of potassium, bromide of potassium, etc., are best avoided, owing to their pernicious influence on the renal functions, and digitalis should be administered in sufficiently large doses to support cardiac action and produce gentle diuresis. The tendency to œdema of both larynx and lungs is greatly diminished by the diuretic action of the digitalis, the heart's action is kept vigorous, and the likelihood of albuminuria—an evil omen in these cases—is greatly diminished. Of great value in the prevention of toxæmia is iodoform, also administered internally, 1 or 2 grains in pill form being given every two hours. It reduced the pulse and seemed to decrease suffering in the cases in which it was used by the writer. The patient's strength should be supported by tincture of the chloride of iron, 15 drops three times a day, mixed with glycerin and water.

Locally, the most effective agent is without a doubt cocaine. A strong solution, 25 per cent., should be applied, however, to obtain satisfactory results. When laryngeal œdema is present the cocaine solution is often sufficient to reduce it and to keep it down. Occasionally it is necessary to scarify freely. Tracheotomy is of doubtful value in this disease, while intubation is difficult to perform, owing to the swelling of the epiglottis and surrounding tissues.[1] It nevertheless has rendered valuable service in this country.[2] Bedford Brown observed that the free application of sinapisms was followed by immediate reduction of laryngeal stenosis.

Food must be soft or liquid and concentrated, in order to obtain as

[1] F. de Haviland Hall, *Journal of Laryngology*, Aug., 1891.

[2] Delavan, *Annual of Universal Med. Sciences*, section E, p. 2, series 1891.

much nutrition as possible from the quantity ingested. F. de Haviland Hall recommends rectal feeding. Stimulants are indicated when the weakness is marked or when profuse diaphoresis is present.

Neuroses of the Larynx.

Motor Paralysis.—The many factors entering into the etiology of motor paralysis must be closely studied before any attempt is made at treatment. The etiological factor once ascertained, little is to be expected unless treatment bearing upon it can be employed. The likelihood of cure corresponds with the degree of amenability to treatment of the original cause. Whether it be syphilis, tuberculosis, aneurism, a cerebral neoplasm, etc., local treatment is absolutely subservient to that of the primary affection, and the treatment of the latter, which does not require elaboration here, is therefore the first indication.

This done, measures must be adopted to stimulate the laryngeal muscles to action. For this purpose faradization employed in the manner indicated on p. 443 is most effective for general distribution of the current through the entire larynx. The laryngeal electrode (Morell Mackenzie's), as shown in the engraving just alluded to, is more effective without water, however, when localized faradization is necessary. The mode of using it is as follows: The electrode being connected with the negative pole of a faradic battery, its extremity is introduced into the larynx, while the positive pole is connected with an ordinary surface electrode which the patient presses over the larynx externally, or with a necklet-electrode. The extremities of both electrodes should be covered with sponge or kid, to prevent stinging. To ensure penetration of the current the electrode tip should be thoroughly wetted before each application. The manipulation of Mackenzie's electrode is like that of an ordinary laryngeal forceps, the mirror being employed to note and conduct the localization of the tip of the instrument. The nearer the paralyzed muscle the application, the better. The electrode being in position, the finger-rest on the top of the handle is depressed, and firm pressure is exerted on the neck by the other electrode. At first this manipulation is quite difficult to perform, gagging and retching preventing the introduction of the instrument. After a few trials, however, the parts become more tolerant, and the application can be borne, in the majority of cases, without trouble. Cocaine anæsthesia may be used in difficult cases, at least the first few times.[1] Each application of the current should last but a few seconds, and be repeated several times at short intervals. One sitting every day should be obtained if possible.

The current may also be applied by placing one pole on each side

[1] Sajous, *Lectures on Diseases of the Nose and Throat*, Phila., 1885.

of the neck externally. This method is very inferior to that just described. Better than it is electrical massage, which is carried out by placing the positive pole, thoroughly wetted, on one side of the larynx, and the fingers of the opposite hand (that holding the negative pole and in contact with the sponge) on the other side. The fingers, having become the conductors, are moved up and down and pressed into the surface of the neck, in the manner practised by masseurs. They must also be kept wet by occasional immersion in water.

Strychnine, nux vomica, and other nerve-tonics should be used, if possible, to assist the electrical stimulus. Strychnine is especially valuable, either by the mouth or hypodermically, beginning with $\frac{1}{60}$ grain at a dose three times a day, and gradually increasing until $\frac{1}{20}$ grain is reached. This dose cannot be taken by all patients, however, and the physiological effects of the drug should therefore carefully be watched.

Hysterical Aphonia.

The methods just described, and especially that illustrated on p. 443, may be used in the treatment of this affection. Response to the treatment often occurs at once; in some, however, nothing seems to cause return of the normal voice—most probably because of atrophy of the paralyzed muscles. Nerve-stimulants—valerian in the form of the elixir of the valerianate of ammonia, 1 teaspoonful night and morning—greatly assist recovery. Valerianate of zinc is another valuable agent, 1 grain being taken night and morning. Rabuteau's pills are indicated when anæmia is present, while nerve-tonics—strychnine, nux vomica, arsenic, and quinine—are of great assistance in the majority of cases.

Spasm of the Larynx.

This affection, variously termed laryngismus stridulus, spasm of the glottis, spasmodic croup, pseudo-croup, etc., presents as characteristic a sudden closure of the larynx, preventing the free inspiration of air, and greatly resembling the manifestations of true croup, from which it differs only in the fact that it is purely a nervous disorder. Like true croup, it is a disease almost invariably observed in children, and it offers very few points that enable the practitioner to establish a positive differential diagnosis within the short space of time at his disposal before the urgency of the symptoms demands active interference. Unless clear indications as to the origin of the trouble can at once be determined, it is best to proceed with measures calculated to meet the danger of suffocation, leaving the determination of its true nature until all immediate danger has been eliminated. Whatever be the actual condition, a warm mustard foot-bath or a general bath usually serves its purpose very rapidly, and if the little patient can

be made to take a drink of any warm liquid he may like, it greatly assists the suppression of the spasm by encouraging diaphoresis. Of equal value in both disorders is the production of emesis, either by titillating the back of the mouth with a feather or administering ipecac. The triturate tablets recommended by Northrup,[1] four or five of the $\frac{1}{100}$-grain tablets, given every ten to thirty minutes until four or five have been taken, are specially valuable for this purpose. When the spasm occurs in connection with difficult teething, making the diagnosis of true laryngismus almost certain, a few whiffs of chloroform or ether sometimes act favorably at once. The possibility of impaction of the epiglottis is to be remembered as a causative element, and should it be found free no harm will follow the introduction of the finger, which in case of impaction would have raised it without difficulty. The usual practices of dashing cold water in the child's face, slapping the back, applying a piece of ice suddenly to the back of the neck, had better be employed only when the diagnosis of simple spasm is assured. The application of a sinapism to the liver tends to prevent recurrence of the attacks. The bromides, chloral, opium, belladonna, etc. also act advantageously in this particular.

When all means fail to re-establish normal respiration and the dyspnœa continues marked, intubation should be practised. If instruments be not at hand to perform the operation, the trachea must be opened or a catheter introduced into the larynx to temporize until intubation instruments can be obtained.

Tumors of the Larynx.

A laryngeal neoplasm may be removed by means of caustics or the galvano-cautery, scraped off with the finger-nail, cut off with the knife or wire loop, or extirpated with forceps.

Chromic acid is doubtless the most easily managed escharotic, and is very efficacious in small, soft growths when the latter cannot be grasped with the forceps. It is also of great value for the cauterization of remnants of tumors which could not be caught in the grasp of the instrument, and to prevent recurrence. For its application a good instrument is that invented by MacCoy of Philadelphia.

The chromic acid dissolved by heat on the end of the covered probe is exposed only when the tip of the instrument is in contact with the neoplasm. Preliminary anæsthesia of the larynx with a 20 per cent. solution of cocaine renders the application comparatively easy. It should be used twice a week until every vestige of the tumor has disappeared.

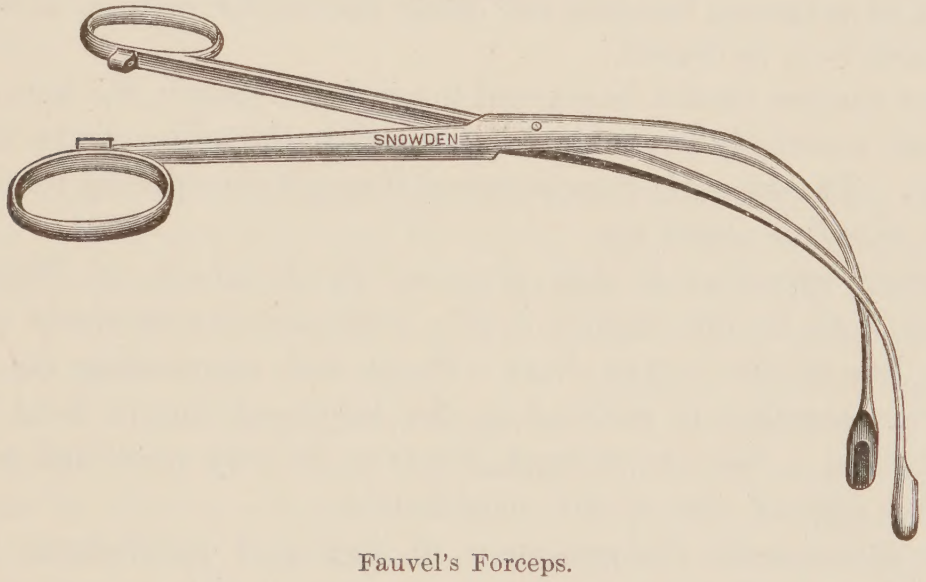
Removal with the finger-nail may be performed, according to Cohen, when soft tumors are situated high up in the upper portion of

[1] Keating's *Cyclopœdia of the Diseases of Children*, p. 520.

the larynx. A small guarded probe-pointed bistoury mounted upon a suitable handle is employed by some operators, especially when the growth is located on the edge of a vocal band. But with this instrument, besides the hæmorrhage which follows incisions unaccompanied by crushing, there is danger of dropping the separated portion of the growth into the trachea. This disadvantage also characterizes operations with the cold or galvano-caustic snare. The latter instrument may, however, be employed to great advantage to cauterize the base of the tumor.

A great variety of laryngeal forceps for the removal of tumors are at our disposal, best known among which are Morell Mackenzie's, Fauvel's, Cuzco's, and Schroetter's. Before the introduction of cocaine as an anæsthetic Mackenzie's instrument was the most extensively used, owing to the sharper angle of its blades, which made it possible to perform the operation without much contact with the epiglottis. When the latter is thoroughly anæsthetized, however, an instrument curved like Fauvel's, as shown in the engraving, is preferable, the epiglottis

FIG. 15.



Fauvel's Forceps.

being held well up by the pressure of the blades, and permitting the reflection from the laryngeal mirror to illuminate the seat of operation much more brightly. Cuzco's forceps is another suitably-shaped instrument, its free and delicate action enabling it to be used without much motion of the hand.

A point of importance is the rapidity with which cocaine anæsthesia passes off in the larynx, owing to the copious flow of translucent lubricating fluid which the application of the anæsthetic occasions.[1] The fact that it lasts hardly ten minutes, even when a 25 per cent. solution

[1] See Sajous, *Lectures on Diseases of the Nose and Throat*, Philada., 1885, p. 387; *Transactions of Pennsylvania State Medical Society*, 1886; *Transactions of the Am. Laryngological Association*, 1888, p. 124; *Journal of the Am. Med. Assoc.*, May 3, 1890.

is employed, suggests that no time be lost after complete anæsthesia is obtained by repeated applications. The steps of the operation are as follows :[1] The tongue being held by the patient, and the mirror being in position, the forceps, previously warmed slightly, are introduced cautiously into the larynx, and as the tumor is grasped the claws are pressed against its base in order to sink them somewhat into the seat of implantation. The result of this manœuvre is to remove the tumor entire. As soon as the claws close on the growth the instrument is removed, its anterior portion being first raised slightly to detach the growth. Polished instruments when in position reflect the color of the surrounding surfaces, and are not easily seen. The writer, in order to follow the end of the instrument with his eye to the best advantage, blackens the claws by exposing them to fire. A bluish-black color is the result, which greatly contrasts with the surrounding parts. Slight bleeding usually follows the operation, but it soon ceases. The dyspnœa occasioned by the tumor is at once relieved. As far as the voice is concerned, its purity will depend upon the degree of integrity of the vocal bands. Spasm of the glottis has occurred during the removal of a tumor, but it is not likely that under cocaine anæsthesia this danger is to be feared.

When tumors cannot be reached through the mouth, the larynx may be opened anteriorly by an incision through the angle of the thyroid cartilage. The tumor is then removed through the opening thus made, and the wound is closed up.

Another operation is that proposed by Rossbach of Wurzburg, which consists in introducing a thin knife antero-posteriorly into the median line of the larynx from without, and amputating the tumor while the operation is watched in the laryngeal mirror held in the usual position. The tumor must, however, be very small and attached to the free edge of one of the vocal bands.

The spontaneous disappearance of laryngeal papillomata having occurred in several instances after tracheotomy had been performed by Oertel,[2] Hunter Mackenzie,[3] Garel,[4] and Eliasberg,[5] the latter author suggests that tracheotomy be considered a mode of treatment for these growths, the transfer of the atmospheric current from the larynx to the tube removing from the former all causes of irritation derived from that source.

The recurrence characterizing malignant growths precludes the employment of curative measures other than evulsion, involving at times the entire larynx. Extirpation of the larynx is so rarely fol-

[1] *Loc. cit.*, p. 388.
[2] *Volkmann's Sammlung. klin. Vorträge*, p. 2807.
[3] *Journal of Laryngology*, April and June, 1890.
[4] *Revue de Laryngol., d' Otol., et de Rhin.*, July, 1891.
[5] *Meditz. Obozren.*, No. 1, p. 46, 1891.

lowed by complete recovery as hardly to be warrantable. Tracheotomy performed early generally prolongs life several months, owing to the free respiration it procures and the rest it obtains for the diseased parts.

Comparative comfort may be secured for the patient by palliative measures. Lukewarm detergent sprays, by rendering the discharges liquid, enable the patient to rid himself of their presence without the painful scraping and hawking that would otherwise be required. Cocaine is here of very great use in the relief of pain and to enable the patient to take food. A 10 per cent. spray may be employed with advantage. When deglutition becomes painful, Bryson Delavan's alimentation bottle will serve a useful purpose to nourish the patient. The flexible cathether of small size, which replaces the ordinary stomach-tube, is introduced, not into the stomach, but simply below the pharyngeal constrictors, along either pyriform sinus, beyond the seat of trouble. Milk, soups, koumyss, etc. can easily be administered in this way. During the first few days the parts had better be anæsthetized with cocaine before introducing the flexible catheter. After that no resistance is offered and the patient can generally use it himself.

Foreign Bodies in the Larynx.

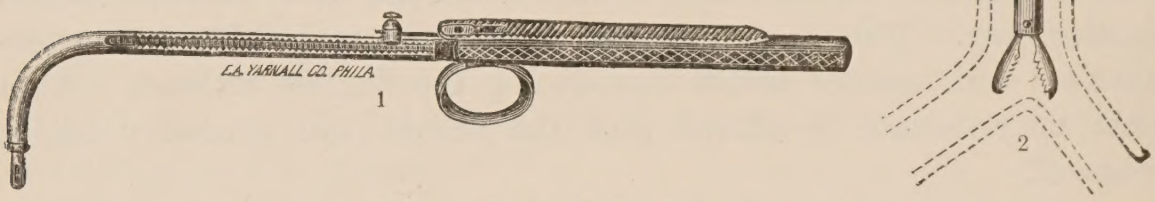
The spasmodic cough and dyspnœa immediately following the introduction of a foreign body into the cavity of the larynx usually make it impossible to take advantage of the great assistance that the laryngeal mirror would offer in ascertaining the location of the body, and in the measures adopted for its removal. The cough, however, usually soon stops, but if it continue and the dyspnœa be but slight, a spray of a 10 per cent. solution of cocaine will arrest it in a few moments. When this can be done a suitable forceps, by judicious manipulation, will withdraw anything that may have entered the laryngeal cavity.

It is not always, however, that the opportunity to obtain suitable instruments presents itself. Assistance in many cases is needed at once. The simplest means are sometimes sufficient to dislodge an impacted body. A violent slap on the back, just as an expulsory effort is made by the sufferer, is often successful. In some the object remains over the aperture of the larynx, and can easily be removed with the finger. As we have seen under the heading of Foreign Bodies in the Pharynx, the epiglottis may be held down by the impacted body, so as completely to close the laryngeal aperture; the finger can also be used in this case. Inversion of the patient, by standing him on his hands while his feet are held up, may prove at once successful, especially if the object in the larynx has a certain amount of weight—a piece of money, a button, etc.

Sharp objects, such as pins, needles, tacks, etc., while penetrating the tissues and holding on with much force, do not cause dyspnœa, and, the parts being thoroughly anæsthetized, can be withdrawn without much trouble by means of a pair of forceps, such as Fauvel's or Cuzco's. The instrument shown herewith, especially constructed for this purpose and for the withdrawal of false membrane, can be made to reach even the bifurcation of the trachea if necessary. The smallest object can be grasped with it.

When, owing to the impossibility of withdrawing the foreign body, suffocation is threatened, tracheotomy becomes necessary. If the proper instruments are not at hand, the trachea may be opened with a penknife, and the wound kept open with bent

FIG. 16.



Sajous's Foreign-Body Extractor.

1, General view of instrument; 2, the foreign-body tip pushed into trachea.

hair-pins held in place by means of pieces of tape tied around the patient's neck; or the thyro-cricoid membrane may be divided, thus furnishing a sufficient opening for the admission of air until more decided measures can be adopted.

Opening of the trachea may also be performed to enable an object located there to be coughed out. In this case the wound should be longer than for ordinary tracheotomy to render spontaneous extrusion of the foreign body possible. Such an opening might also be made low down for the removal of foreign bodies lodged in either bronchus, the tracheal mucous membrane being thoroughly anæsthetized with cocaine, and a small mirror inserted to guide the introduction and withdrawal of the proper instrument, whose shaft may be armed with a tip arranged to grasp the object impacted.

DIPHTHERIA AND TRUE CROUP.

By J. CHALMERS CAMERON,[1] M. D., M. R. C. P. I.

General Considerations.

Of all the infectious diseases prevalent in this country, diphtheria is the most dreaded. It is dreaded because popular notions respecting it are hazy and indefinite. Even a cursory glance over its voluminous literature speedily shows that its treatment is too often random and erratic, being seldom based upon clear ideas respecting its nature and tendencies. The mind of the profession has been confused by the fierce fight between the localists and constitutionalists; and, although the battle is now virtually won, the dust and smoke of combat still envelop the battlefield and prevent a general perception of the true state of affairs. If there is one disease more than another in which a man should have convictions, and the courage to act upon them, it is diphtheria. Clear views, decision, and promptness in action have saved many lives that would have been lost by timidity and hesitation. Let me, then, at the outset, make my confession of faith, upon which I base treatment. Diphtheria is a local specific disease due to the presence and action of bacilli, characterized by a deposit of pseudo-membrane at the site of infection, accompanied by constitutional disturbances and followed by nervous symptoms due to the absorption into the circulation of a virulent chemical agent (toxalbumin), which is produced by the local development of the bacilli. Diphtheria and croup are identical. Though their identity has not yet been proven scientifically, yet clinically and practically the balance of evidence is in favor of this view. Those physicians who believe that true croup is diphtheria and contagious, and who base their treatment upon this belief, will succeed in saving life and limiting the spread of disease, when those will fail who soothe their own consciences and comfort anxious relatives and friends with the doctrine that croup is a local inflammatory and non-contagious disease, and neglect isolation and disinfection accordingly. If there is still a doubt, we should not allow it to make us careless in our practice.

If the treatment of diphtheria is to be rational, it must be based

[1] I desire to acknowledge my indebtedness for assistance in the preparation of this article to Dr. Birkett of Montreal, Junior Demonstrator of Anatomy in McGill University, whose services have been very valuable.

upon clear ideas respecting its etiology and pathology. I would recommend every one interested in this subject to study carefully Professor Welch's admirable address upon the *Causation of Diphtheria.* From a pathological point of view he comes to conclusions quite in accord with those derived from clinical experience, and which have long been my key to treatment.

To treat diphtheria understandingly and with success, one must be prepared to answer with no uncertain sound such questions as these: Is diphtheria primarily a *local* or a *constitutional* disease? Should its treatment be primarily local or constitutional? If local, when should we begin with constitutional measures? Is local treatment necessary in all cases, or does it in some cases or in some stages do more harm than good?

It is evident, therefore, that from the standpoint of treatment it is of the utmost importance for the practitioner to grasp the full significance of the fact that diphtheria is local before it becomes constitutional. According to Welch, diphtheritic bacilli develop only locally at the site of infection, and are found only in the pseudo-membrane, mostly on the surface, not even in the subjacent mucous membrane; they do not invade the tissues or circulation, but generate at the point of entrance a highly poisonous chemical substance, the absorption of which produces constitutional symptoms. If these views respecting the nature of diphtheria are correct, what course should one adopt when called to a case of diphtheria in the early stage? It seems reasonable to say that, after a diagnosis is made, vigorous local treatment is indicated to destroy the bacilli and prevent as far as possible the formation and absorption of toxic albumin, not forgetting at the same time to maintain the general strength. At the outset, therefore, local treatment is plainly the main indication, but as the case progresses general treatment assumes more importance; and as the later stages are reached chief reliance must be placed upon general measures, local treatment then being often harassing and fatiguing, doing more harm than good. If the case is not seen at the outset, the bacilli have had time to do their work, and general absorption of the chemical poison has taken place. Under such circumstances it would be folly to devote the same attention to local measures as if the case had been seen early. The fight is then no longer local, but constitutional, and its issue will depend upon the relative virulence of the poison and the resisting power of the organism. In such a state of affairs common sense would lead us to feed, stimulate, and support, strengthening weak points, anticipating and averting threatened dangers, while local precautions are taken to destroy the bacilli and prevent the body from being flooded with fresh doses of poison.

We have germicides in various forms for local treatment; we have

judicious feeding, stimulants, iron, digitalis, strychnine, mercury, etc. for general constitutional treatment. The practitioner who possesses tact to gauge his patient's strength through the various stages of the disease, to combine his local and general treatment according to the varying exigencies of the case, will find the treatment of dipththeria as rational and satisfactory as that of any other disease; but to succeed he must abjure empiricism and learn to treat his patient rather than the disease.

From what has been already said, it is evident that early and exact diagnosis is essential. The only pathognomonic feature of diphtheria invariably present is the specific micro-organism known as the Klebs-Löffler bacillus. The researches of Klebs, Löffler, Roux, Yersin, Welch, and others have abundantly proved that this bacillus is the causative agent in diphtheria, and that it produces at the point of infection a chemical poison whose absorption into the circulation gives rise to important nervous symptoms. It is needless, therefore, to describe minutely the diphtheritic pseudo-membrane and its microscopical appearances: full information upon such points can be found in any of the recent standard works on pathology. Suffice it to say that the diphtheritic membrane may appear in three different forms, but the severity of the case does not necessarily depend upon the presence of one form more than another, as any of them may be present in either a mild or a severe case. The forms are—

(1) Membrane lying on the mucous membrane of the pharynx, and removable without much injury to the underlying parts.

(2) Membrane involving the epithelium and upper layers of the mucous membrane.

(3) White or gray infiltration of deeper structures, sometimes resulting in necrosis.

But it is of practical importance to know something about the bacillus whose presence causes the disease, for a positive diagnosis in any doubtful case rests solely upon the detection of this micro-organism. In well-marked cases the clinical symptoms may suffice for diagnosis, but diphtheria is seen in so many varieties and in such varying degrees of intensity, and there are so many border-land and spurious cases during epidemics, that the practitioner often hesitates to pronounce a doubtful case to be diphtheria, and subject the family to all the anxieties, discomforts, and inconveniences of isolation and disinfection. Yet if he fails to adopt necessary precautions, even in the mildest cases, infection may spread, and he may be the unwitting cause of much suffering, and perhaps of even loss of life. It is therefore of the greatest practical importance for the practitioner to be in a position to determine whether the specific bacillus is present in any given case, and consequently whether the case is one of diphtheria or not.

To detect the Klebs-Löffler bacillus is a very simple matter for a

pathologist provided with suitable apparatus; but most general practitioners will find themselves unable to carry out the necessary investigation without special facilities. A good microscope provided with a high-power immersion lens and a hot-air chamber, which can be kept constantly at about blood-heat, are essential. If a small piece of membrane is removed and wrapped in paper, it may be sent to a competent observer and a positive opinion obtained within twenty-four hours as to the nature of the disease. For the complete examination of a suspected case three distinct procedures are required:

1. Examination of the membrane on cover-glass preparations;
2. Inoculation and culture of the bacilli on serum;
3. Inoculation of the culture bacilli into a guinea-pig to prove their pathogenic power.

The method of carrying out the examination need not be detailed here. Although it is necessary for accurate scientific investigation, a simpler method has been devised for clinical purposes, by which the bacilli can be detected through their mode of growth on serum, and the microscopical examination of the growing colonies. In direct examination of the membrane the bacilli may readily escape notice, or other pathogenic organisms may be confused with them. To carry out the cultures on serum, some hydrocele, pleuritic, or ascitic fluid is stiffened and sterilized at the same time by placing test-tubes closed with cotton-wool plugs obliquely in an oven heated to 75° C. for an hour, and afterward raising the temperature to 90° C. for half an hour. This higher-temperature exposure is repeated on three successive days in order to sterilize the serum. A platinum loop is applied to the membrane and drawn over the surface of the serum three or four times. Two or more tubes should be inoculated in this way without reinfecting the loop. The cotton plugs are replaced and the tubes put in an incubator at 35° C. to 37° C. If the specific bacillus is present, small flat grayish-white detachable growths, the size of pin-heads, are formed in *eighteen* hours. All other forms of bacilli take at least *twenty-four* hours, and the forms most likely to be present then are staphylococci, which are easily distinguished by their rounded form under the microscope. If the cultures succeed, the culture-growths should be examined microscopically with a $\frac{1}{12}$ oil-immersion lens, so as to avoid any possible confusion. For this purpose a drop of boiled distilled water is placed on a cover-glass which has been washed in alcohol and dried. One of the colonies is then touched with a platinum needle, and the drop of water spread evenly over the cover with the needle and allowed to dry in the air. The cover, held in a pair of forceps, is then passed three times through the flame of a Bunsen burner or spirit lamp, and stained with carbol fuchsin or any of the aniline dyes. The bacilli are now seen as short, thick rods about the length of tubercle bacilli.

The protoplasm is usually beaded and granular, while the ends of many of the rods show a club-shaped expansion like a drumstick. They are arranged in little clumps, often very close together.

Besides this specific bacillus, Löffler discovered in croupal pseudo-membranes a pseudo-bacillus, either alone or accompanying the true bacillus, which very closely resembles it, but has no injurious effects when inoculated into animals. There is some difference of opinion as to whether this is a distinct micro-organism or a modified, attenuated form of the specific bacillus. The weight of opinion seems to be in favor of the latter view, and if correct many obscure points in the history and treatment of diphtheria will be cleared up. The attenuated virus (pseudo-bacillus) is very widespread, and, having lost its virulence, in process of time may under certain circumstances regain it. It is consequently very important to use antiseptic sprays and gargles at the beginning of simple and scarlatinal anginas, especially if diphtheria is prevalent. In diphtheria epidemics many cases are sent to hospitals, especially from poorer districts, with pharyngeal symptoms, with or without membrane. Some of these are diphtheritic, others not; if non-diphtheritic and placed in the infectious wards, the patient is exposed to serious danger. The only way in which a positive diagnosis can be reached is to make a bacteriological examination and demonstrate the presence or absence of bacilli or pseudo-bacilli. In hospitals provision should be made for such examinations in doubtful cases, and the patient isolated till the diagnosis is positive. In the immense majority of cases, if a shred of membrane is taken while fresh and examined microscopically, a diagnosis can be made at once. As the case proceeds toward recovery the specific bacilli diminish in number, but may not entirely disappear until long after all traces of membrane are gone. The number of bacilli (true or attenuated) in any case, and their increase or decrease, may aid materially in prognosis.

Clinically, cases of diphtheria may be conveniently classified according to their frequency of occurrence as follows:

1. Pharyngeal;
2. Nasal;
3. Laryngeal;
4. Ocular;
5. Cutaneous;
6. Aural.

Diphtheria attacks all ages: it is fairly common under three months, and may even attack newborn infants. In some families there seems to be a predisposition to the disease. It is more apt to attack scrofulous children and those with large, prominent tonsils and numerous enlarged glands.

Pharyngeal Diphtheria.

Pharyngeal Diphtheria is by far the commonest form of the disease. The pseudo-membrane is found most frequently on the tonsils, less frequently on the posterior wall of the pharynx. From these situations the disease may extend upward, involving the nose, lachrymal duct, and Eustachian tubes, or downward, involving the trachea and its divisions. The period of incubation is one or two days, or even as long as fourteen days when the disease is directly communicated to a healthy mucous membrane. The onset is usually that of an ordinary sore throat, and if the throat be inspected simple erythema of the fauces may be observed, or localized erythema on either pillar or fauces. These symptoms may be preceded by a sensation of chilliness or even by an actual chill. In children the attack may be ushered in by convulsions. Following the chill and sore throat there are a feeling of lassitude and depression, with pain in the head and small of the back, a tired feeling in the legs, anorexia, and restlessness. There may be slight pain and difficulty in swallowing, a rapid pulse, and slight elevation of temperature. The late Dr. R. L. MacDonnell of Montreal was the first to observe that an early symptom in the majority of cases is loss of the knee-jerk. This symptom is found in all the varieties of diphtheria. Albuminuria may appear in any of the forms of diphtheria, and is not of itself to be regarded as of serious moment. As the case progresses examination of the pharynx shows that the catarrhal stage has been followed by the development of a thin yellowish membrane on the surface of either tonsil or both, or perhaps on the posterior wall of the pharynx. This membrane gradually assumes a dirty-gray color; its edges are sharply defined, and the surrounding portions of tonsils or pharynx have a deep-red or purplish hue. Here and there small hæmorrhagic points may be seen in some cases. The secretion from the mucous glands becomes more tenacious and slightly yellowish in color, and fœtor of the breath is perceptible. The submaxillary and post-cervical glands enlarge and become tender at this stage of the disease. The temperature varies between the normal and 101° F. In ordinary mild cases the pulse is not much altered. The occurrence of a rash in the course of any form of diphtheria is not unusual. The rash is usually erythematous, like that seen in scarlet fever, although eruptions sometimes occur similar to those of measles, roseola, or urticaria. In the malignant type a purpuric rash, like that of purpura hæmorrhagica, is not uncommon. In the pharyngeal form we occasionally meet with gangrene: this condition is rare, and always associated with a severe type of the disease. It usually attacks the soft palate, and often results in the destruction of the uvula or one of the palatine arches. The tonsils

are rarely involved in the gangrenous process. Delirium does not usually occur in mild cases, but is almost invariably present in the graver forms. It is usually of a mild, wandering character. A severe attack is generally accompanied with rigors, a temperature of 105°–107° or subnormal, and is attended with nervous symptoms, as vomiting, convulsions, etc. If the membrane is forcibly or accidentally removed, it is rapidly reproduced. The lymphatics are very quickly involved, and the glandular and periglandular structure infiltrated. The neck on the affected side is much swollen, the membrane dark, and the odor very offensive.

Such being the clinical picture of pharyngeal diphtheria, what are we to do for our patient? Certain general directions are applicable to all forms of diphtheria: these will now be considered, special directions for special forms being given in their appropriate places.

Isolation.—A large, airy room should be selected, preferably at the top of the house and on the sunny side: it is difficult or impossible to isolate the patient completely on the lower floors. An open fireplace is an advantage. Carpets, curtains, mats, ornaments, and all unnecessary articles of furniture should be removed. A sheet kept wet with a disinfectant solution should be hung outside the door. Special attendants should be provided, and no others permitted in the sick-room. Dishes, towels, clothing, bedding, and utensils used in the room should be kept there, and not allowed to be carried through the house or used elsewhere. Dishes and utensils should be washed in the room or in a sink or wash-room not used by the other members of the household. Soiled clothes should be covered with a boiling disinfectant solution before being taken from the room, and great care exercised in washing them. The discharges from the nose or mouth should be received in an earthenware or glass vessel containing sublimate solution (1 : 5000), or in pieces of clean old soft linen, which should be burned immediately. The excreta should be received in glazed earthenware utensils containing sublimate solution (1 : 5000). Cats, birds, dogs, or other households pets should not be allowed in the room, for they are often the means of spreading infection. The room should be kept clear of flies, for they too have been accused of bearing infective particles from room to room and from house to house. The sanitary arrangements of closets, sinks, traps, and pipes should be closely examined and rectified if defective. Food should not be allowed to remain exposed in the sick-room; milk is particularly apt to absorb impurities from the air. The more thorough the precautions, the more likely will strict isolation be obtained.

Diphtheria is highly contagious, the infective bacilli being present in particles of diphtheritic exudation which are coughed, sneezed, or spat up; they are found also in the saliva, nasal mucus, and dis-

charges from a diphtheritic patch wherever present. They may even be breathed out, and thus infect the air. These infective particles readily attach themselves to the clothing of the patient or his attendants, to the walls, furniture, bedding, dishes, books, papers, and pets, or may float about in the dust and air of the room. It is manifestly of the utmost importance to collect and destroy immediately those discharges which are the vehicles of infection, and keep the air pure by thorough ventilation. As a further precaution a disinfectant solution should be kept constantly vaporizing in the room. A small coal-oil stove is better than a gas stove for this purpose. The following formula is useful and the odor is not unpleasant:

℞. Ol. eucalypt.,
Acid. carbolic., āā. ʒvj;
Spts. terebinth., ad ℥vj.—M.
Sig. One table-spoonful in a pint of water.

In the immense majority of cases infection takes place by contact, though it may occur by other means, such as air, water, and milk. A little thought should enable the practitioner to adapt his measures for isolation and disinfection to the varying circumstances and conditions of the case. It is possible, even in the poorest homes and under very unpromising conditions, to adopt measures which will limit the spread of the disease.

If great care is not observed in collecting or destroying infective discharges as soon as possible, ventilating the sick-room, changing and disinfecting bedding and clothing, the patient may reinfect himself and suffer from repeated relapses. During convalescence the patient should have a change of apartment if possible, one for night and another for day, so that the rooms may be aired and fumigated when not in use. If repeated relapses occur or the membrane persists in reforming, there is probably some focus of infection which has not been recognized and destroyed. Upon removal to new quarters in a new locality improvement often sets in rapidly.

As the virus of diphtheria remains active in the mouth for a long time after the patient is convalescent, he must never be allowed to mingle with others till all risk of infection is over. Particularly is this the case with regard to school-children. It is difficult to fix a time-limit in this respect. It has been shown that at least eight days must elapse after the disappearance of all local manifestations. But just here comes the difficulty: When can local manifestations be said to have ceased? In the nasal form of diphtheria an acrid discharge often persists for weeks, or even months, after other symptoms have disappeared and the child is running around. I am sure that I

have more than once been able to trace the source of infection back to such a cause. In cases of doubt it would be safer to examine the discharges repeatedly for the presence of bacilli before giving a clean bill of health. Löffler mentions four weeks from the beginning of the attack as the proper time for children to be kept out of school. This is evidently only a rough guess, and cannot safely be adopted as a working rule in practice. In my opinion, very little reliance can be placed upon an average time limit when applied to individual cases. Each must be judged upon its own merits, and the only safe way to decide that a child will no longer scatter infection is to ascertain by bacteriological examinations of the affected parts and the discharges therefrom whether the specific micro-organism has disappeared. If so, then the greatest care should be taken to see that the nails, hair, ears, and body of the patient are thoroughly clean, and that no clothing is worn which has been exposed to infection. The methods of disinfection of the patient's clothing and bedding have been described in the article on Disinfection in Vol. I.

Feeding.—As the tendency of diphtheria is to debilitate, and as recovery often depends upon the strength and staying power of the patient, it is obvious that the greatest care must be taken from the very outset to keep up nourishment. As a rule, solids should be avoided and the most nutritious and digestible liquids selected. It is needful sometimes to give nourishment in concentrated form when the stomach is irritable, or to peptonize it, or even to feed wholly or partially by means of enemata. Milk and cream, alternated with beef- or chicken-broth or jelly, should be given regularly and at frequent intervals. Raw eggs, eggs beaten up with milk or tea, the whites of two or three eggs beaten up with milk, and home-made ice-cream, will be found useful. Those foods should be selected which contain much nourishment in small bulk; it is not safe to defer too much to the whims and fancies of the patient. The struggle may be short and sharp; therefore nourishment must be given and strength maintained. Feeding is an important part of the treatment, and the physician should not content himself with vague or indefinite directions about diet, nor should he entrust such an important matter to parents or nurses, however skilful; he should lay out a diet-table as carefully as he prescribes medicines, and should at each visit satisfy himself that his directions are being carried out. It is my firm belief that many children treated medicinally after the most approved methods have been allowed to perish through neglect in this respect. In the early days of their practice physicians are apt to think too much of drugs and too little of food and hygiene.

Medicinal Treatment.

The object of *local* treatment is to destroy the bacilli and their products; the object of *internal* treatment is to support the general strength and neutralize or obviate the effects of the toxic albumin which is being absorbed. Hosts of drugs have been recommended singly and in combination to accomplish these ends. A new treatment is proposed, is highly vaunted, tried for a time with more or less success, and discarded for some fresh novelty. In a few years perhaps it is resuscitated, and in a new dress or with new sponsors is launched forth again, to run the same course. Some drugs which were fashionable fifteen years ago are being vaunted to-day as new specifics for diphtheria. Truly history repeats itself. Without giving formulæ or entering into details the following drugs and methods of treatment may be mentioned:

Acetic acid (Uytterhoeven, 1865).

Carbolic acid (Bunce, 1873).

Citric acid (Caspari, 1877).

Hydrochloric acid (Martin, 1858).

Lactic acid (Dureau, 1868); advocated recently as a new remedy.

Salicylic acid (Rickrath, 1876).

Sulphurous acid (Yeomans, 1881).

Sulphuric acid, locally.

Tannic acid (1868).

Alum (Bretonneau, 1827).

Nitrate of silver, in strong solution and solid stick (Authenac, 1828, and Blanchard, 1869).

Cauterization (Beaupoil, 1877).

Chloral (Carney, 1879).

Corrosive sublimate (Billotti, 1876).

Cubebs and copaiba (Bergeron, 1870).

Chlorine (Alford, 1859).

Oil of eucalyptus (Mosler, 1879).

Galvanism (Schwauda, 1871).

Guaiac resin (Day, 1870).

Mercurial ointment, inunction (Ebert, 1866).

Mercury fumigations (Corbin, 1881–82).

Ice (Bleynie, 1878).

Iodine, inhalation (Curran, 1867).

Perchloride of iron, locally and internally (Rey, 1861).

Monsel's solution (Fernsworth, 1864).

Iodoform (Defaix, 1881–82).

Oxygen gas (Robinson, 1879); now used in the form of hydrogen peroxide.

Pepsin, acidulated solution (Doughty, 1868).

Papaine (Bouchut, 1881).

Pilocarpine (Payrandeau, Paris, 1881); internally or hypodermically.

Potassium bromide, local application (Peyraud, 1880).

Potassium permanganate, hypodermically (Brown, 1879).

Quinine sulphate, as a gargle (Brakenridge, 1875).

Sodium chloride (Butth, 1880).

Sodium bicarbonate (Roustan, 1861).

Sodium sulphocarbolate (Anthony, 1876).

Sodium benzoate (Clossen, 1879).

Sodium hyposulphite (Burd, 1880).

Rectified spirits (Bricheteau, 1864).

Sulphur (Abelin, 1869).

Tonsillotomy (Bigelow, 1860).

Vichy water (Baron, 1851).

Among the drugs most vaunted as solvents of the membrane may be mentioned papayotin, trypsin, pepsin, and peroxide of hydrogen. The last mentioned is by far the most serviceable and reliable. Corrosive sublimate, first used by Billotti fifteen years ago, is highly esteemed by some and denounced by others. Its chief value is in the treatment of laryngeal diphtheria, and it will be referred to under that heading.

Dr. Jacobi says that diphtheria cannot be treated by any other drug as well as by the bichloride, as it is readily soluble and counteracts the specific poison—in Germany it is freely used. Rennert[1] reported recently the results of a year's treatment with it. His formula is—

Hydrarg. chlor. corrosiv.,	1 part;
Acid. tartaric.,	5 parts;
Aquæ,	1000 parts.

Wrap a wad of cotton (1 in. long, ½ in. thick) about a pincette, and wipe off the diphtheritic patch. Swab the bleeding surface thoroughly with the solution: sometimes three to five wads are required for each side of the throat before the membrane is wholly removed. Repeat the applications every six to twelve hours. When the tonsils are clear, use a larger wad to swab over the entire pharynx. The acid solution of the bichloride acts more intensely than the simple solution. The fever usually declines after the second application. In nasal diphtheria a boric-acid solution (3 per cent.) is used alternately with the sublimate applications. Rennert reports 62 consecutive recoveries, but to be successful he says this treatment must be carried out

[1] *Berlin. klin. Woch.*, Aug. 26.

thoroughly. In none of his cases were there any symptoms of mercurial poisoning.

In England the biniodide-of-mercury treatment advocated by Dr. C. R. Illingworth has been highly praised. The membrane usually disappears in two to five days, except in very severe cases. The iron-and-chlorate-of-potash mixture is substituted after the membrane has gone. Dr. Illingworth's formula is—

℞. Liq. hydrarg. perchlor., fʒiij;
Potas. iodid., grs. x;
Ferri et ammon. citrat., grs. xx;
Syrupi, fʒiv;
Aquæ, fʒij.—M.

Sig. One tea-spoonful every two hours (for a child of two to four years).

Sir Morell Mackenzie places great faith in salicylic acid in the treatment of diphtheria, and the following is his favorite prescription:

℞. Acidi salicylici, ʒiss;
Alcoholis, fʒijss;
Aquæ destillat., q. s. ad fʒvj.—M.

Sig. One to two tea-spoonsful, to be given every three hours.

At the recent London meeting of the International Congress of Hygiene (August, 1891), Mr. Turner of Gloucester reported very satisfactory results from the *paraffin* treatment of diphtheria. The membrane is scraped or peeled off, and paraffin applied to the raw surface every hour by means of a large camel's-hair brush. The throat usually gets well in one or two days. The applications are made less frequently as improvement goes on, but are continued occasionally for two or three days after the entire disappearance of the patches. Tonsillitis was found to follow in some cases. The ordinary paraffin used in lamps is employed; it should not be allowed to remain exposed to the air, but should be poured from the can when about to be used. The curative effects are probably due to the action of the higher hydrocarbons present in paraffin. If the liquid form is found inconvenient, it may be semi-solidified by agitating it with a soap or saponin. It was suggested to make a paraffin ointment by agitating paraffin with 10 per cent. of warm water containing 1 per cent. of saponaria bark. The ointment could be brushed on the throat in larger quantity, and would adhere better. It was also suggested to alternate the ointment applications with a vapor or spray of paraffin. The method is worthy of trial.

Without entering into the various merits and demerits of the numerous drugs and plans of treatment now in vogue, it will suffice to outline a rational treatment suitable for most cases. Of course, as I said before, each case must be treated upon its own merits: symptoms must be treated as they arise, threatening danger guarded against, and the treatment modified or changed according to circumstances. It is impossible to treat diphtheria successfully with two or three ready-made prescriptions; it is the patient who must be treated, not the disease.

Locally.—Every four hours the throat should be sprayed with a 10-volume solution of peroxide of hydrogen, either pure or diluted with an equal quantity of water. One table-spoonful of the undiluted peroxide may be used in the day for infants and children under three years. Between three and ten years double the quantity or more may be sprayed. The best form of atomizer is the water-oil atomizer made by Ellis and Goltermann: the nozzles are of vulcanite, and either watery or oily liquids may be used. The same firm makes a cheap atomizer for the throat only, which is sufficient for ordinary nasal and pharyngeal cases. Both forms have a single bulb, but give a continuous spray; they are quite as efficient as the double-bulbed instruments, and are more easily worked. Another good model is the "magic atomizer," No. 30, manufactured by the Davol Rubber Co., Providence, R. I. The tubes and nozzles are of hard rubber, not metal, and the spray is very fine, each compression of the bulb atomizing about four or five minims. It is therefore easy to calculate how many compressions of the bulb will be required to atomize a certain amount of liquid. Coarse sprays are useless, and often harmful when powerful drugs like the bichloride of mercury are used for some length of time. It is well to test the atomizer and ascertain its power and capacity before laying out directions for local treatment. Occasionally corrosive sublimate spray (1 : 5000) seems to have a more powerful effect on false membrane than the peroxide, and in some cases both kinds may be used with advantage alternately or day about. In children who will gargle it is well to alternate the spray with a gargle of sublimate solution (1 : 5000). In some cases, where the spray is not well borne or cannot be readily applied, and when the membrane is thin and situated only on the tonsils, the insufflation of sulphur is useful. If an insufflator is not at hand, a small tube of letter-paper, having the calibre of an ordinary lead pencil, will answer the purpose very well. The tonsils having been brought well into view, a little sulphur can be blown upon each; this should be repeated every hour or two. When the child can gargle it is well to use a warm gargle of chlorate of potassium and glycerin before applying the sulphur:

℞. Potassii chlorat., ʒj;
Glycerini, ʒij;
Aquæ, ℥viij.—M.

It is important in all these throat applications to see that food or drink is taken *before* the application, not *after*. It is well to draw up a time-table for the use of the attendants, marking at each hour or half hour what is to be done, taking care to arrange the proper sequence of food, medicine, and local applications. This is a point which is too often neglected in practice, and it is one of great importance. The stomach is apt to rebel against frequent feeding and the administration of drugs like iron, unless the greatest care is taken to spare it as much as possible. If the stomach gives out before the disease is well mastered, the chances of recovery become much impaired. Any tenderness of the submaxillary and post-cervical glands may be relieved by the application of hot linseed-meal poultices or hot fomentations every four hours.

Internally.—In the internal treatment of diphtheria there is no drug so generally useful as tincture of the chloride of iron. It is not only a good general tonic, but also a powerful stimulant to the nervous system. A convenient way of giving it to an infant one year old is as follows:

℞. Tinct. ferri chloridi, ♏iss;
Acidi phosphorici dilut., ♏j;
Glycerini, ♏ij;
Spts. chloroformi, ♏j;
Aquæ, q. s. ad fʒj.—M.
Sig. To be given every three hours, well diluted with water.

To older children the iron may be given in much larger doses. Children of two and three years often bear 5 to 10 minims. It is open to question, however, whether the heroic doses recommended by some physicians are needful or advisable. When iron is pushed too far the stomach is apt to rebel, and then food is rejected as well as the medicine. It is safer to be content with moderate doses at short intervals, always given well diluted and not too close to food. Chlorate of potassium is highly extolled, and may be given alone or combined with iron. Jacobi has drawn attention to the injurious effects of large doses of this drug upon the kidneys. He places the maximum daily dose at 20 grains for a child of one year or under, 30 grains for one of two or three years, 90 to 120 grains for an adult. Even these doses he considers dangerous if persisted in for many days.

The patient should be kept in a recumbent position as much as

possible, and free from violent exertion or excitement. Food and medicine may be administered with a feeding-cup without disturbing the child at all. Local applications must be made quickly and gently; unnecessary examinations of the throat should be avoided. When an application is to be made, the nurse should not permit the child to rise, but should herself gently raise him into the proper position. Heart failure is one of the pressing dangers; hence every means must be taken to spare the heart and keep the circulation tranquil. The condition of the pulse and the first sound at the apex of the heart should be carefully watched for signs of failure.

Stimulants are indicated in diphtheria almost from the outset; it is better to err on the safe side and give them too early rather than too late. Champagne is the best at the outset or when the stomach is irritable or in the case of young infants. Half a tea-spoonful to a tea-spoonful may be given to an infant every hour or two. In administering stimulants the object is to keep a constant moderate effect; they should be given, therefore, in small and oft-repeated doses. If large doses are given at long intervals, the desired effect is not produced; indeed, they may do positive injury; for the large dose causes needless exaltation, followed inevitably by depression; and it is in the stage of depression that the heart is apt to fail. When champagne is not available or is unsuitable, good old brandy or whiskey should be used; wines, as a rule, are uncertain, and had better be reserved for convalescence. The dose of the stimulant should be regulated according to the effect on the pulse. A dose which is sufficient to-day may be inadequate to-morrow, or perhaps a large dose which is imperative to-day may be reduced to-morrow. There should be no hard-and-fast rule as to the quantity of stimulants employed, any more than as to the dose of iron or digitalis. If the heart shows signs of weakness and the pulse becomes small, compressible, and irregular, digitalis is required. In diphtheria large doses are borne well, and the drug should be pushed till the heart begins to respond. For an infant of one year 1 minim of the tincture may be given every two or three hours; for an adult, 5 or 10 minims. The dose must be regulated by circumstances, but it must not be forgotten that the action of digitalis is apt to be cumulative, and large doses should not be kept up for any length of time.

Nasal Diphtheria.

Nasal diphtheria may be either primary or secondary. When secondary, the disease has extended up the posterior nares from the pharynx. The invasion of the nasal tract may be suspected when nasal respiration is obstructed and the patient breathes chiefly or wholly through the mouth. A thin, ichorous, muco-purulent discharge appears

in one nostril or both; small excoriations and ulcerations form at the entrance of the nares, on the upper lip, or wherever the discharge is allowed to rest. Nasal diphtheria is especially apt to occur in children who have more or less large collections of adenoid tissue in the vault of the pharynx. Such children are usually mouth-breathers, or become so when they take the slightest cold. They snore at night, and their sleep is restless and broken. When they contract diphtheria, it usually spreads rapidly to the nares, and seriously complicates the case. Epistaxis is apt to occur.

The cervical glands soon become involved, as the lymphatics from the nose empty into them. Glandular enlargement and constitutional symptoms appear much sooner in nasal than in pharyngeal diphtheria. Local treatment is more difficult to apply, and cannot be made as thoroughly; the prognosis is much graver. Great attention must be paid to local cleanliness. Gentle douching, spraying, or syringing with weak solutions of chlorate of potassium and glycerin, or borax and glycerin, to which a little carbolic acid may be added, will be very soothing and improve the character of the discharge. The peroxide of hydrogen spray is here also of great benefit, but there is one practical hint which may be given respecting its use. The nozzle of the atomizer should be kept exactly in the middle line of the nares, otherwise it may impinge upon the septum or inferior turbinated bone and bring on epistaxis. There is usually not much difficulty in removing portions of the diphtheritic membrane from the nose. This should be done as far as possible, taking care to avoid all rough manipulations.

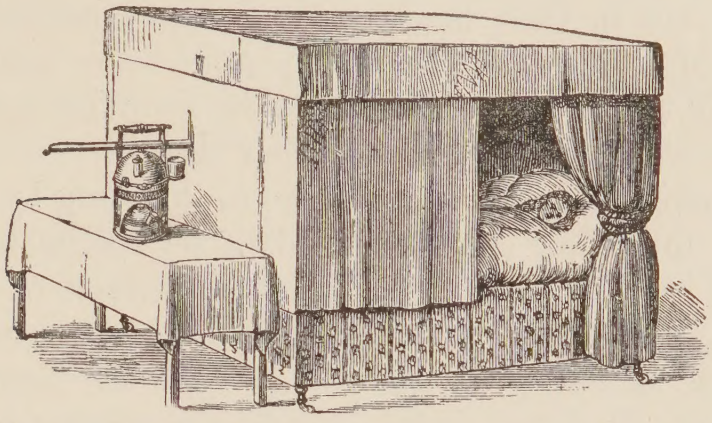
The general treatment is on the same lines as in pharyngeal diphtheria.

Laryngeal Diphtheria.

Laryngeal diphtheria may be either primary or secondary. The more common form is the secondary: it is then an extension of the morbid process from nose or pharynx downward. The onset of laryngeal diphtheria is recognized by a harsh, dry, shrill, or hoarse muffled cough. The voice is husky, weak, and sometimes almost inaudible. The breathing is embarrassed, intermittingly at first, constantly afterward. Associated with the cough is a spasmodic closure of the glottis and a temporary increase of dyspnœa. If a laryngoscopic examination be made in this condition, the false and true vocal cords will be found intensely hyperæmic and swollen, with patches of membrane here and there; in some cases the whole interior of the larynx is covered with a dense, tough, grayish membrane. In this form of diphtheria the use of steam as an inhalation is very beneficial. With adults the steam atomizer may answer the purpose, but with children a tent should be constructed over the cot, so that the child may breathe a steam-saturated air without effort. The tent should not be wholly closed, but

ample space left open on one side for ventilation. The air in the tent is kept saturated with steam by means of a tube from a croup-kettle.

FIG. 17.



The tent is easily constructed by fixing an upright post, three feet long, to each post of the bed: upon these rest four cross-bars, and over this skeleton frame sheets are placed. The steam may be admitted into the tent as shown in diagram.

Care should be taken that the nozzle which conveys the steam is not allowed to come too close to the child; serious burns and scalds have resulted from neglect of this precaution. The steam may be used plain or medicated with some disinfectant. Oil of turpentine is probably the best: 1 table-spoonful may be added to the water in the kettle every two or three hours. Oil of eucalyptus (1 drachm every two or three hours) is highly spoken of by some. Carbolic acid is still used, but the risk of absorption and the damage which it may do to the kidneys should make us careful about using it for any length of time. Lime-water is much esteemed by some as having a powerful solvent effect upon the membrane. Vapo-cresoline is a popular remedy, and is thought to be very powerful, probably because it has such a villainously bad smell. The tar treatment has also been highly extolled. A pot of tar is kept heated in the room by means of a spirit lamp. It is efficient in many cases, but is messy and dirty.

Local applications, so useful in nasal and pharyngeal diphtheria, are useless here, and should be discontinued when the nose and pharynx are clear. With regard to the value of emetics in laryngeal diphtheria there has been much difference of opinion. On *a priori* grounds one would hesitate to administer a powerful depressant in a disease the danger of which is depression. O'Dwyer says all that can safely be said in favor of emetics; his opinion is as follows: "In what may be called sthenic cases, when the dyspnœa becomes urgent and abiding, or, in other words, when it is time to operate, prompt, vigorous emesis, such as is produced by the yellow sulphate of mercury, often gives marked relief, which sometimes lasts long enough to render a repetition of the vomiting safe if stimulants and nourishment be administered in the interim. By this means I have succeeded in getting a good many cases through, especially those that had been placed on the bichloride

treatment at the commencement of the disease, that would otherwise have required intubation."

The internal administration of bichloride of mercury is advocated by many, and has in their hands proved very beneficial. The dose for an infant of one year is $\frac{1}{150}$ to $\frac{1}{100}$ grain every hour. It is best administered in milk. Its effect should be carefully watched, and it should not be continued longer than four days.

Notwithstanding the high praise given to this drug by its friends, it does not seem to produce such uniformly good results as tincture of the chloride of iron. A formula for the administration of this drug has already been given. It may be administered continuously and with benefit through all stages of the disease without untoward effects, whereas mercury is found useful only in the severer forms, can be continued only a short time, and must be carefully watched. The chief drawback to prolonged iron treatment is its tendency to produce irritability of the stomach. But if it be given sufficiently diluted, and not too close to food, that disadvantage will be reduced to a minimum.

It is in the laryngeal form of diphtheria that the patient requires the most careful watching. If obstruction to the breathing increases, as evidenced by the aggravation of the symptoms already mentioned, it becomes our duty to interfere and relieve the obstruction mechanically if possible. This may be done in two ways—by *intubation* or by *tracheotomy*. For surgical measures to have a fair chance of success early interference is necessary. The patient must not be allowed to drift along into an almost moribund condition before we operate if we expect any good results from the operation. When the breathing has become stridulous, inspiration difficult, the clavicles, sternum, ribs, and diaphragm retracted; when the child is tossing about, extending its neck in the vain effort to get air; when the lips are cyanotic and the face of an ashen hue,—we may give temporary relief by operating, but the chances of ultimate recovery are not as good as if we had interfered before the onset of these grave symptoms. It is a serious matter to decide upon operative measures in these cases, but it is my firm belief that it is safer to err upon the side of early operation, especially if the operation is to be intubation.

Having decided to interfere, which operation should be selected, intubation or tracheotomy? After going carefully over the opinions of most recent writers upon this question and weighing the "pros" and "cons" of each method, it seems that opinions are pretty evenly divided as to their relative value. Statistics show very little difference in the results. Intubation gives $26\frac{2}{5}$ per cent. of recoveries, and tracheotomy $26\frac{1}{2}$ per cent. (Stern). The indications which would be helpful in determining the choice of operation have been well summarized by Stern, as follows:

"1. All things being equal, I would always intubate when the patient is under three and a half years of age.

"2. Between the ages of three and a half and five years I would be regulated of course by individual circumstances, with a preference for tracheotomy.

"3. Over five years of age I would perform tracheotomy.

"4. In adults I would never tracheotomize, but willingly test intubation.

"5. Amongst poor people, irrespective of age, I would always intubate. While it sounds harsh to draw such class distinctions, good reasons are forthcoming. The general results of intubation are about equal to those of tracheotomy. Skilled attendance, such as is always required after tracheotomy, can only be procured for considerable purchasing power, and is in consequence only available where people have means. While the operator himself may be willing to give his own valuable time, he may owe to other patients attendance that may be of as much value to them as to the child operated upon.

"6. Intubation should never be performed at any age where there is a strong probability that the trachea is crowded with membrane.

"7. Where skilled assistants cannot be obtained intubation should always be practised."[1]

It now remains to detail the method of performing these operations.

Intubation.—O'Dwyer's method of operating has not been improved upon; here is the description of his operation in his own words:

"*The Instruments.*—A set of intubation instruments consists of six tubes, each supplied with a separate obturator, an introducer (Fig. 21), extractor (Fig. 20), mouth-gag (Fig. 18), and a scale (Fig. 19). The obturator when in position projects a little beyond the lower extremity of the tube, and is rounded off into a probe point to prevent pushing down pseudo-membrane and injuring the tissues of the larynx. It also serves as a means of attachment to the introducer. The numbers on the scale indicate the years for which the corresponding tubes are suitable. The smallest tube when applied to the scale will reach the first line, marked 1, and is suitable for children of one year and under. This tube can be used with children of two years with perfect safety, as far as slipping into the trachea is concerned, but the probability of its being coughed out would be great. The second size reaches the line marked 2, and is suitable for children between one and two years old. The third size is for children between two and four years old, and the next size for children from four to seven years old. The next size, reaching the line marked 8–12 on the scale, is for children up to twelve years of age, but not after puberty, as the

[1] Max Stern, *Trans. Ninth International Medical Congress*, vol. iv., 1887.

sudden increase in the size of the larynx at this time would render it liable to pass through into the trachea. The largest size is intended

FIG. 18.

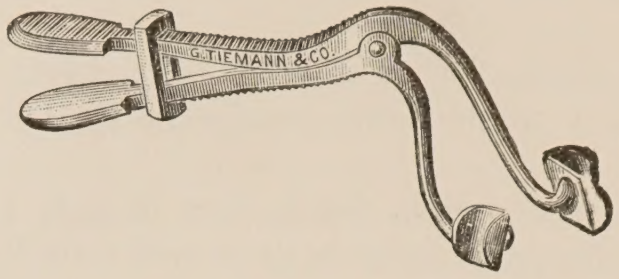


FIG. 19.

FIG. 20.

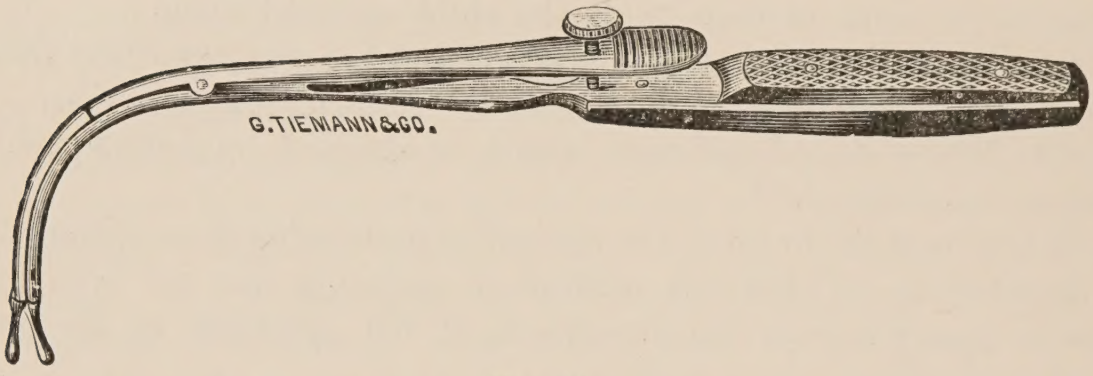
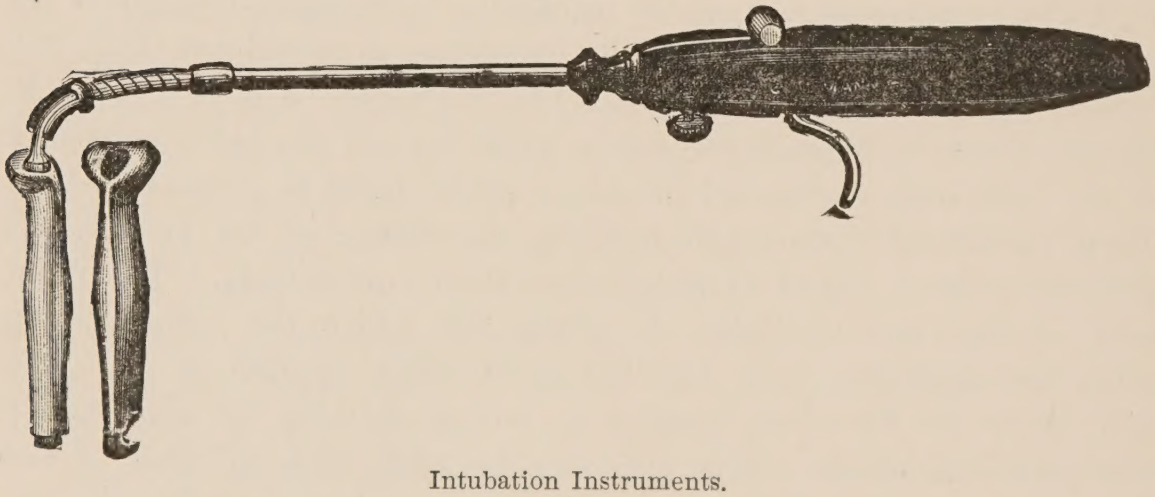


FIG. 21.



Intubation Instruments.

for those children whose larynx is so large that the No. 5 tube is not retained.

"The female larynx in children, as in adults, is smaller than the male, which should be taken into consideration in selecting the tube, as well as the size of the child compared with its age. For instance, in a small delicate girl of four years a No. 2 tube would be the proper one; while, on the other hand, in some boys of three and a

half years it would be advisable to use the 5–7 size, especially if the case is a considerable distance from you, and coughing out the tube would entail some danger and a great deal of inconvenience.

"When the proper tube is selected for the case a fine thread of braided silk is passed through the small hole near its anterior angle, and left long enough to hang out of the mouth, its object being to remove the tube should it be found to have passed into the œsophagus. The obturator is then screwed tightly to the introducer and passed into the tube. It is well to push off the tube once or twice before using it, to see that everything works smoothly.

"*Method of Introducing the Tube.*—The following is the method of introducing the tube, which is done without the use of an anæsthetic: The child is held upright in the arms of the nurse, with its head on her left shoulder, to avoid interfering with the mouth-gag, and the arms are secured to the sides, either by being held below the elbows by the nurse or by wrapping a sheet around the body. The legs should be secured between the nurse's knees. The gag is inserted in the left angle of the mouth, well back between the teeth, and opened as widely as possible without using undue force. An assistant holds the head, thrown somewhat backward, while the operator inserts the index finger of the left hand to elevate the epiglottis and direct the tube into the larynx. The instruments should be worked in the median line, the operator facing the patient squarely. The handle of the introducer is held close to the patient's chest in the beginning of the operation, and rapidly elevated as the tube approaches the glottis. Very little force is necessary to overcome the obstruction, and if the tube does not enter the larynx easily, it should be withdrawn and another attempt made. It should be pushed well down into the larynx before it is detached from the obturator; and while removing the obturator it is necessary to keep the finger in contact with the head of the tube, to prevent it being also withdrawn. The string should not be removed until the dyspnœa is relieved and the operator is certain that the tube is in the larynx. In some cases the string causes so very slight an amount of irritation that I allow it to remain for ten or fifteen minutes, to excite more cough and thus expel the accumulated secretion and overcome any collapse of the lung that may exist. When the thread is withdrawn the finger must be kept in contact with the tube to prevent its being also withdrawn. In removing the tube the child is held in the same position, but the head is not thrown quite as far back. The finger which is used as a guide for the extractor is brought in contact with the head of the tube, and then pressed toward the patient's right, in order to uncover the aperture and allow the extractor to enter in a straight line. Continuous pressure with the thumb is made on the lever above the handle while the tube is being withdrawn.

"Owing to the small aperture of the tube compared with the size of the larynx, the extraction of the tube is more difficult than its insertion. It is during this part of the operation that the greatest amount of injury is liable to be done to the larynx by pushing the instrument down outside the tube and removing it forcibly with the blades widely open. It requires no force whatever to remove a tube from the larynx, and if any resistance is felt, it will be found that the point of the extractor is not in the tube, but caught in the surrounding tissues. To reduce this danger as much as possible, I have added a regulating screw, which prevents the blades from opening wider than is necessary to hold the tube firmly. It can be adjusted to suit a tube of any size.

"What are the evidences of the tube being in the larynx? The first thing noticed is that cough sets in which has a decidedly tubal character, and once heard is not readily forgotten. The more or less cyanotic condition usually disappears, and the child becomes more quiet. When the tube has been passed into the œsophagus instead of the larynx, this is known by the string which is attached to the tube becoming gradually shorter, by the absence of much spasmodic cough, and the non-relief to the dyspnœa.

"Being satisfied that the tube is in the larynx, and that the condition of the child is satisfactory, the string may be removed, and the next step is the careful feeding of the patient. To avoid the tendency of food finding its way into the larynx, it is well to adopt Waxham's plan of feeding young children under such circumstances; and that is to so place the child that its head is lower than its feet, fluid food being administered by means of an ordinary feeding-bottle to which a rubber nipple is attached. To alleviate thirst, Waxham recommends cracked ice and ice cream. Stimulants should under these circumstances be administered only by enemata."

Another important question is, When shall the tube be removed? In answering this question we are again indebted to O'Dwyer for the answer. "The proper time for removing the tube from the larynx," he says, "will depend upon the age of the patient, the character of the disease, whether of slow or rapid development, and the progress of the case. The younger the patient, as a rule, the longer the tube will be required. In children under two years it is better to leave it in for seven days. When the disease has developed slowly, and has therefore run a greater part of its course before calling for operative interference, the tube can be dispensed with earlier, sometimes as soon as the second or third day. If the case be at such a distance as to render it impossible to reach it in a reasonable time, it is safer, if progressing favorably, to leave the tube in position for seven or eight days, and the exceptions are few in which it will be necessary to reinsert it after this time. The tube

should always be removed on the recurrence of severe dyspnœa, because it is sometimes impossible to ascertain with certainty whether it be partially obstructed or not. The best evidence to the contrary is a good respiratory murmur or numerous râles over the lower portion of the lungs. The development of a high temperature, especially if accompanied with any considerable amount of bronchitis on the third or fourth day, is a sufficient reason for removing the canula, as it can sometimes be permanently dispensed with as early as this; and even if left out only for a few hours without urgent dyspnœa, is of great benefit, as it affords an opportunity to unload the bronchi of secretions by permitting complete closure of the glottis, and thus giving full effect to the act of coughing.

"In those cases which refuse nourishment after intubation, or that cannot be induced to take a sufficient quantity, it is useless to remove the tube for the purpose of feeding, unless it has been in long enough to give some reasonable hope that its further use will not be necessary, as it is difficult to convince children for some time that they can swallow any better than before. If no dyspnœa recurs in half an hour after the extraction of the tube, it is safe to leave the patient if not at too great a distance to be reached within two or three hours."

Tracheotomy.—What instruments are required for this operation? One good straight-back scalpel (Fig. 22), grooved director with aneur-

Fig. 22.

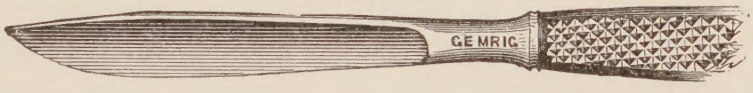


Fig. 23.

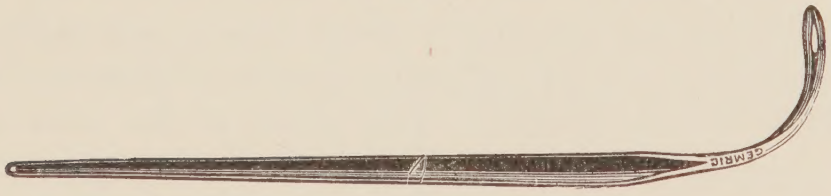


Fig. 24.

Fig. 25.

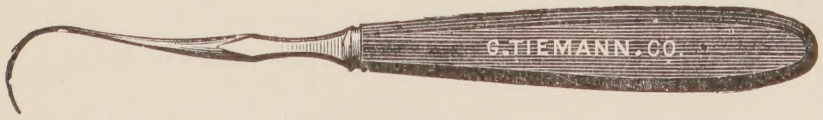


Fig. 26.

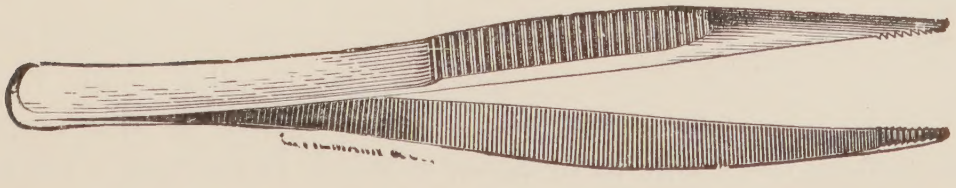
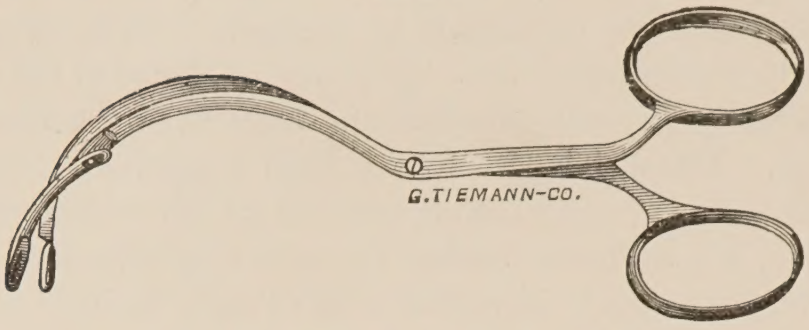
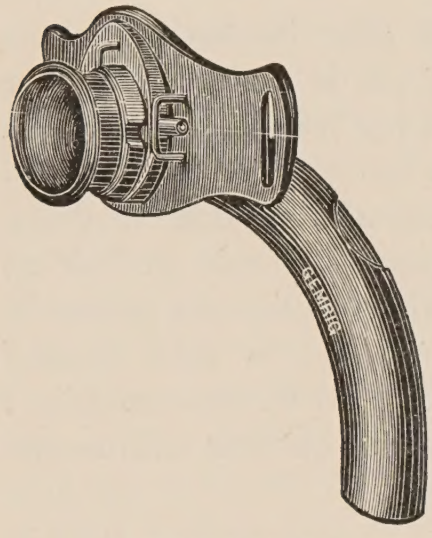


Fig. 27.



ism-needle handle (Fig. 23), two blunt retractors (Fig. 24), one sharp hook (Fig. 25), dissecting-forceps (Fig. 26), tracheal forceps to remove membrane from the lumen of the trachea (Fig. 27), half a dozen Péan's artery-forceps, carbolized catgut ligatures (No. 2), one straight needle, silkworm gut sutures, one pair of scissors, one dozen thoroughly aseptic sponges, bichloride gauze, a yard of half-inch tape, a tracheotomy-tube (Fig. 28).

Fig. 28.

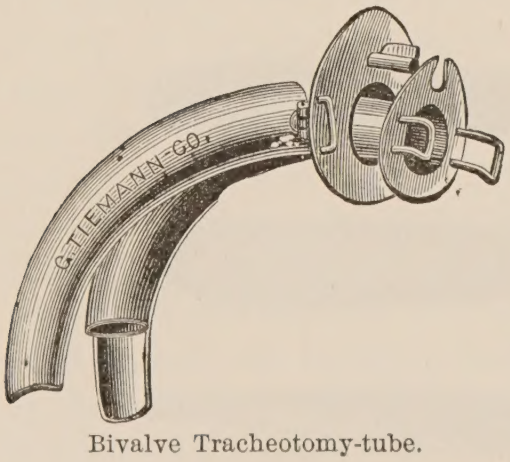


Tracheotomy-tube.

What is the best kind of tracheotomy-tube to use? Like most instruments, the tracheotomy-tube has been varied and modified considerably. All tubes have certain things in common—viz. an outer and inner tube, and a neck-piece to which tapes are attached to hold the tube in position. The one most commonly in use is made of hard rubber. The objection to this tube is that it must be made considerably thicker than a silver one, so that with the same diameter the lumen of the vulcanite tube is smaller.

Another form is the bivalve. The blades of the outer canula are fixed to the collar, and come in contact with each other when the inner tube is removed. This is to allow the tube to be inserted easily into the trachea. The blades are separated from each other by the introduction of the inner tube. The facility with which this tube is introduced into the trachea is the advantage claimed for it.

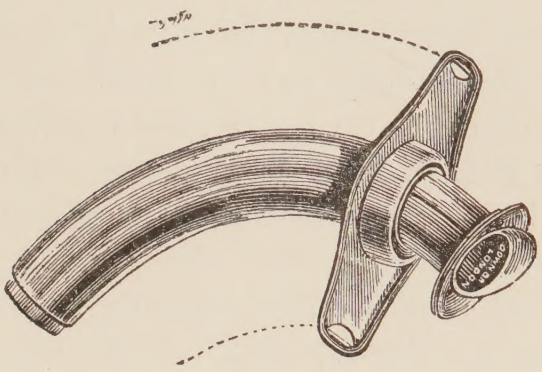
Fig. 29.



Bivalve Tracheotomy-tube.

Other tubes in common use are Parker's, with a pilot, and Bryant's. Cuts of these tubes are appended. The tube which is the most convenient, and on the whole to be recommended, is Durham's lobster-tail

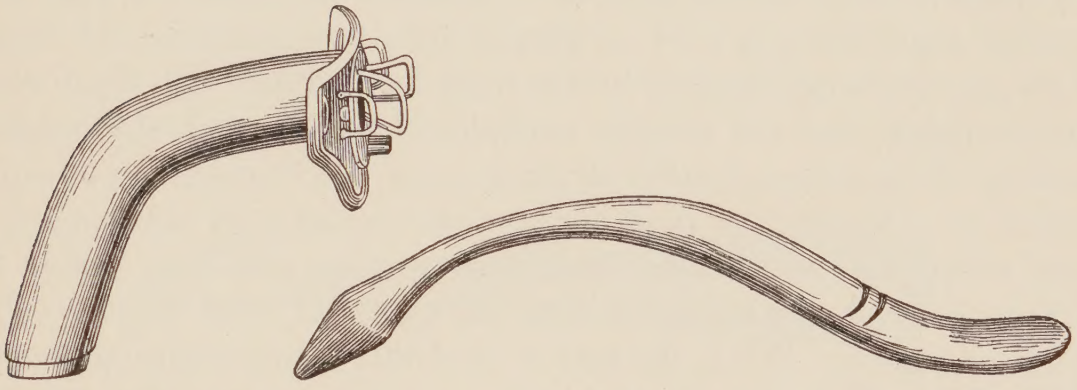
FIG. 30.



Bryant's Tube.

tube (Fig. 32). It is made of silver, and consists of an outer tube A,

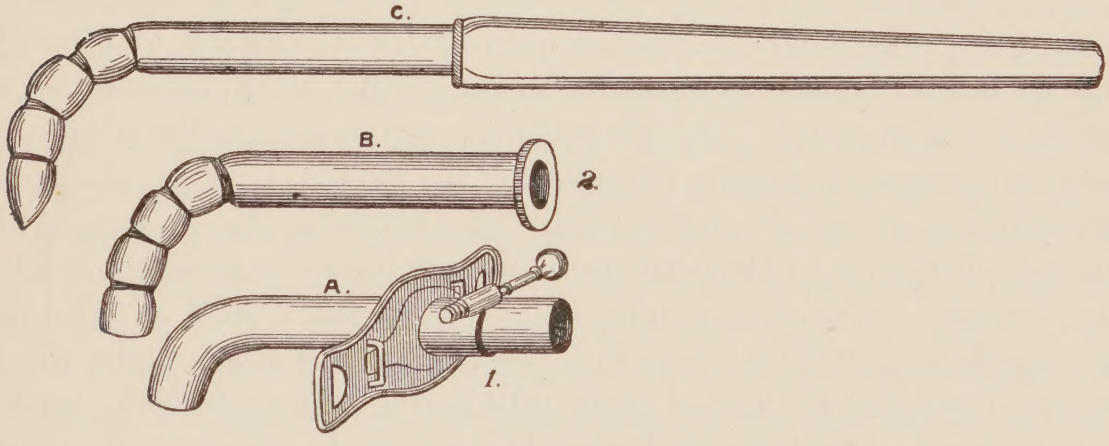
FIG. 31.



Parker's Tube. Pilot for same.

to which is attached the collar (1), which is capable of being fixed at any point along the outer tube by a screw (2). B is the inner tube,

FIG. 32.



Durham's Tube.

and C is the pilot. The advantages claimed for Durham's tube are that its shape is more in conformity with the direction of the external wound and that of the windpipe; it does not, like other tubes, irritate or abrade the anterior surface of the tracheal walls. As the position of the tube-end within the trachea depends upon the depth

of the trachea from the surface, this can be adjusted to each individual by shortening or lengthening the tube by means of the movable collar. The tubes are usually put up in sets of four.

Dr. James Bell of Montreal has devised a substitute for the tracheotomy-tube. This is known as Bell's hook. Appended is his own description of the instrument and the advantages he claims for it over the tracheotomy-tube:

"Being convinced that the tracheotomy-tube in diphtheritic cases was an evil (perhaps a necessary one), but nevertheless an evil and a source of many dangers, I endeavored to dispense with its use—first, by suturing the edges of the tracheal incision to the edges of the skin wound, then by wire specula, and finally with the clasps which I still use. The advantages claimed for these clasps are—(1) That they allow of greater facilities for the removal of tracheal and bronchial secretions through the wound, as well as greater breathing-space, as the lumen of the trachea is not lessened by the walls of the tube. (2) That where the membrane has not already extended down beyond the tracheal incision, direct contamination of the trachea and bronchi may be prevented by plugging the trachea above the wound with antiseptic tampons, which may be changed from time to time, and thus enable the surgeon to bring the operation into the sphere of what may be called modern surgery. While the tube is used this is practically an impossibility. (3) That the dangers arising from the use of a tube are avoided; and, finally, that there are no inherent disadvantages or dangers in the use of the clasps themselves. The dangers arising from the use of a tube I will simply enumerate; I am sure every operator is familiar with them. They are as follows: (1) The tube acts by its outer surface as a direct conductor of the irritating and poisonous (if not directly inoculable) discharges from above downward, and by filling the wound makes it impossible to cut off the communication above by means of tampons. (2) By lessening the lumen of the trachea, as well as by directly offering resistance to the expulsion of the secretions, it becomes a source of much trouble and anxiety to the surgeon, while the patient becomes exhausted by ineffectual efforts to clear the trachea and bronchi. This is especially noticeable on the second or third day after operation, when the secretions become dry and sticky and a tough, viscid plug forms at the end of the tube and on the walls of the trachea just beyond. (3) As it is impossible exactly to adapt a tube to the varying anatomical formations, its extremity always impinges on some part of the tracheal wall, often producing ulceration—sometimes, indeed, into the innominate vessels.

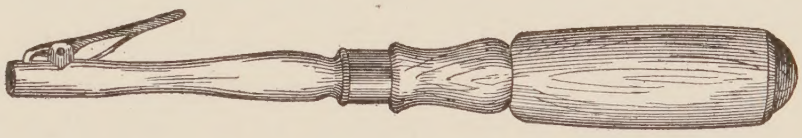
"Suturing the edges of the tracheal wound to the skin I found unsatisfactory. First of all, it is tedious; then it drags upon the trachea, and if swelling occurs the sutures tear or ulcerate through the

tracheal tissues; and finally, if the patient turns the head from side to side, the superficial tissues close the orifice. Wire specula, in addition to possessing many of the dangers of the tube, are difficult of fixation and unreliable.

"The clasp, which is of different widths (5 to 8 mm.) and from 3 to 5 cm. long, consists of a light band of spring steel doubled upon itself and bent to the shape of a quarter of a circle. At the fold the two bands are welded together, so as to allow of the free ends lying about a quarter of an inch apart. The edges of these free ends are bent in toward each other and serrated, while a slot runs longitudinally through the two portions, in which is a sliding rivet, which when pushed toward the points closes them. These serrated inturned edges are to grasp the edges of the tracheal incision, while the sliding rivet fastens them upon it. Some flat links are attached to the other end, and a removable handle enables the surgeon to hold the instrument in posi-

FIG. 33.

FIG. 34.



tion, while the sliding rivet fastens it upon the tracheal tissues. The free edges are cut somewhat obliquely, so that when tied around the neck by tapes the tracheal wound edges may be drawn as nearly as possible transversely away from each other. With a clasp on each edge of the incision a tampon in the upper segment of the trachea or lower portion of the larynx, the secretions come readily into the wound, and may be removed by a glass tube with suction-bulb (like a medicine-dropper) or by a soft swab of cotton wool or sponge, while the wound remains open no matter what position the patient assumes."

All the instruments, sutures, and ligatures should be boiled in clean water for at least twenty minutes before the operation. They are then removed and placed in a shallow dish containing solution of carbolic acid (1 : 40). The sutures and ligatures, previously cut into the required lengths, are placed in separate bowls containing a solution of bichloride (1 : 3000). The site of operation should first be washed thoroughly with soap and water, and then wiped over with bichloride solution (1 : 2000).

The operator and his assistants should themselves observe the strictest cleanliness (asepsis).

The anæsthetic should be chloroform in preference to ether, as the latter is apt to augment the dyspnœa by increasing bronchial secretion. The anæsthetic must be administered with great care, and its effect

closely watched: profound narcosis should not be produced or the cyanotic condition of the patient may be aggravated; moreover, there is greater danger of suffocation from the passage of blood into the windpipe if the patient is deeply narcotized. It is better to operate during the first stage of anæsthesia.

The Operation.—The patient is placed before a good light, on the back, with a large round pillow under the shoulders, so as to allow the head to be somewhat depressed, thus putting the structures of the neck on the stretch and bringing the trachea near the surface. The operator stands on the right side of the patient, his assistant on the left. With the thumb and second finger of the left hand the operator fixes the larynx, and with the index finger of the same hand the cricoid cartilage is located. An incision is made from this point downward *in the middle line* to one inch above the episternal notch. The superficial and deep fasciæ are divided upon a director *from below upward.* The deeper structures are now more thoroughly exposed by retracting the edges of the incision with blunt hooks. The isthmus of the thyroid gland is now seen lying upon the trachea. The trachea may be opened at one of three points—(1) above, (2) below, (3) behind the isthmus of the thyroid. The opening should be made below the isthmus, as a better opportunity is afforded to remove any membrane from the deeper part of the trachea than if the opening were made higher up.

The trachea is now brought nearer to the surface with a sharp hook, the isthmus being drawn upward with a blunt hook. All bleeding points should be secured at each step of the operation, especially before opening the windpipe. The operator then passes the first finger of his left hand through the wound down upon the trachea, and guides the knife along that finger to the trachea, which he incises *from below upward,* dividing three or four rings. The inrush of air signifies that the trachea has been opened. The edges of the tracheal wound are held apart with blunt hooks, and any membrane found in the windpipe is removed with the small curved tracheal forceps. Any hæmorrhage which was present before the opening of the trachea generally ceases when air is admitted through the tracheal wound; but if not, the bleeding points should be secured and ligated with catgut.

The bleeding having been arrested and all the membrane possible removed, the tracheotomy-tube is introduced. Previous to the operation the tapes should be fitted and the tube thrust through the centre of three layers of sublimated gauze ($2 \times 1\frac{1}{2}$ inches). The edges of the wound above and below the tube may be brought together with silkworm-gut sutures. The tapes should be arranged to tie at one side of the neck, rather than directly behind.

Sometimes one is called upon to perform rapid tracheotomy. In such a case the operation differs but slightly from the one just

described. The operator makes an incision directly down upon the trachea, instead of dissecting down to it; then, with the index finger of the left hand upon the trachea to locate it, he cuts through the tracheal rings in the manner already described. The tube is then guided into the tracheal wound by the index finger of the left hand, which has been kept in the wound close down upon the trachea. The treatment of the wound and the arrangement of the tube are the same.

The subsequent care of the patient is of the greatest importance. A steam-kettle should be kept in operation in the room, so as to maintain a uniform temperature and keep the air well saturated with moisture. The tube must be carefully attended to. The inner one is removed every half hour and thoroughly cleansed by placing it in boiling water. A camel's-hair brush of moderate size or a feather is used to free the outer tube of any adherent secretion or fragments of membrane. After twenty-four hours the outer tube may be removed, thoroughly cleansed, and returned. The time when the tube may be finally dispensed with varies; in the majority of cases it may be taken out at the end of eight days.

After tracheotomy the patient is fed in the same way as after intubation, except that there is no need of altering the position of the patient when feeding, as there is usually little or no difficulty in swallowing.

During convalescence the patient requires continuous careful nursing. One important feature which is nearly always present is the tendency to syncopal attacks. This may be avoided in great measure by not permitting the patient to rise when being fed, and by keeping him in the recumbent position as much as possible. All sources of excitement should be avoided; relatives and visitors should be excluded from the room, and exciting conversation and news prohibited. In fact, absolute quiet should be maintained as far as possible.

Complications.—*Diphtheritic Paralysis.*—The sequelæ most commonly observed are of nervous origin (paralyses), caused by the absorption of toxic albumin. The commonest form of paralysis is that of the soft palate: the voice becomes harsh and nasal, and fluid regurgitates through the nostrils. Next in frequency comes paralysis of the ciliary and ocular muscles. When the ciliary muscles are involved, we find asthenopic symptoms, mydriasis, or loss of accommodation without mydriasis. When the oculo-motor muscles are affected, there is strabismus, which brings about diplopia and vertigo.

Next in frequency is paralysis of the muscles of the lower extremity. This is usually preceded by a feeling of coldness, numbness, tingling, or pain. There may be anæsthesia, and associated with this analgesia. Ataxic symptoms may develop in severe cases.

The upper extremities may be similarly attacked, or one set of muscles may alone be affected. The muscles of the pharynx and larynx may sometimes be attacked, as evidenced by the difficulty in swallowing and the tendency of food to find its way into the larynx when the pharynx is affected, and by the weakness and altered character of the voice when the laryngeal muscles (intrinsic) are affected.

The pathological nature of these lesions is peripheral neuritis.

In diphtheritic paralysis strychnine has been very warmly recommended by some, and as strongly denounced by others. It is given by the mouth or by hypodermic injection. In children of six to twelve years of age paralysis of the soft palate has been successfully treated by hypodermic injections into the neck of from $\frac{1}{30}$ to $\frac{1}{20}$ of a grain two or three times daily. Improvement has been noticed after the first injection, and in no case did the treatment last more than a week. The weight of opinion, however, seems to be rather against the general use of strychnine in diphtheria. If given at all, the dose should be moderate: for an adult, $\frac{1}{20}$ gr. three times daily; for a child of six, $\frac{1}{100}$ gr.; for children under five it had better not be used at all. Gentle friction or massage over the affected region is preferable in the case of infants and children, as they are generally frightened by electrical treatment. Electricity is very useful in furthering an improvement in paresis or paralysis of any set of muscles. The current should be very slowly interrupted. The negative pole is placed over or as near as possible to the affected muscles. The positive pole is placed at the back of the neck when the paralysis involves the muscles of the upper part of the body, and over the lumbar region when the muscles of the lower part of the body are implicated. As a general rule, the practitioner should remember that the strength of the current which is to be employed should be that which causes the most contraction with the least possible pain.

When electricity is used in paralysis of the ciliary or oculo-motor muscles, the strength of the current should not be greater than from 5 to 7 milliampères, and the first application should not be longer than two minutes. The time may be gradually lengthened to five minutes. In these affections the positive pole is placed over the temple, and the negative pole (a small round sponge being used as the electrode) is placed gently on the closed lid of the affected eye. The paresis or paralysis of the circular fibres of the iris (mydriasis) and of the ciliary muscle may be somewhat helped by instilling night and morning 1 drop of a solution of eserine of the strength of 2 grains to the ounce.

Diphtheritic Conjunctivitis is a condition which falls more correctly under the articles on Diseases of the Eye. (See Volume III.)

Cutaneous Diphtheria is an unusual form of the disease. There must have been abrasion of the affected part through which the diph-

theritic bacillus found entrance. The commonest site is the skin of the upper lip, near the nares. This part is liable to become irritated and excoriated by the acrid discharges from the nose in nasal diphtheria. Pseudo-membrane may also be found about the anus, vulva, vagina, prepuce, and glans penis. The diphtheritic process may attack open wounds, and is particularly disastrous in its affects when it invades traumatisms in the parturient canal of recently-delivered women. It then produces the most virulent puerperal septicæmia, and is usually rapidly fatal.

Wherever deposit occurs in cutaneous diphtheria the membrane is seen as a white, buff, grayish, or black layer of varying thickness, more or less adherent; the surrounding area is usually much reddened. Its extension is preceded by the formation of vesicles.

This form of diphtheria is treated by removing as much of the membrane as possible with a pair of forceps, and then thoroughly irrigating the part with sublimate solution (1 : 2000). The excoriated surface is then dusted with iodoform, boro-iodoform, aristol, or boro-aristol, and dressed with sublimate gauze, the dressing being kept in place by a well-applied bandage.

Prophylactic Measures.

When diphtheria is epidemic are there any precautions which can be adopted to diminish the risk of infection? Under such circumstances the specific bacillus, as well as the pseudo-bacillus, is undoubtedly widely distributed, and is inhaled by a great many people, and very little is needed to precipitate an attack. Many people suffer from pharyngitis during diphtheria epidemics, just as many suffer from diarrhœa, headache, and lassitude when typhoid fever is prevalent. When one member of a family is attacked with diphtheria he should be isolated at once, and parents should be warned of the danger of petting, fondling, and kissing the child and inhaling the infected breath. As many of the family should be sent away as possible, particularly the children. If this cannot be done, a careful inspection of the mouth and throat of every one in the house should be made daily. Chlorate-of-potassium gargles and tablets should be used freely to keep the secretions of mouth and throat healthy. If any one is suffering from nasal catarrh, a mild astringent disinfectant douche or spray should be used several times daily:

℞. Listerine,		f℥j;
Acid. boric.,		gr. vj;
Glycerini,		f℥j;
Aquæ,	q. s.	f℥j.

When diphtheria is epidemic prompt treatment should be given to nasal catarrh, affections of the mouth, tonsils, ears and eyes, abrasions, sores, eruptions of the scalp—in fact, to all solutions of continuity which might afford entrance to the diphtheritic germ. During an epidemic is not a good time to resect enlarged tonsils or to do any surgical operation, and certainly no surgical operation should be attempted if there is diphtheria in the house. Pregnant women require special care before, during, and after confinement. The sanitary condition of the house should be looked into; physician and nurse must see that they do not carry infection on their persons, clothing, or instruments. The utensils employed in the confinement-room should be new; vaginal examinations and douches should be avoided if possible; sublimate jute should be used exclusively for washing and cleansing the vulva, and great care taken in applying and changing the antiseptic vulvar pad. The breasts should be protected from cracks and abrasions, as diphtheria sometimes attacks sore nipples, with disastrous results for both mother and child. Particular pains should be taken in washing the child's mouth, so as to prevent stomatitis and thrush. If a nursing infant contracts diphtheria, it must not be allowed to nurse, or the mother will probably be infected. There would be less risk for a nursing mother if she wore a good nipple-shield.

The physician must hold decided views respecting the infectiousness of diphtheria, for his opinion will often be asked in sanitary questions of local importance. It is a popular belief in many parts of the country that diphtheria may be contracted by inhaling the breath of an infected person, but that it cannot be carried. From what has been already said, it is evident that anything to which particles of diphtheritic membrane adhere may be the means by which infection is spread, and may retain that power for a length of time. Welch says that although the diphtheritic bacillus forms no spores, it is nevertheless one of the more resistant of the non-spore-forming class, and withstands for a long time drying and other influences which are injurious to the less resistant forms. Specific bacilli have been obtained in cultures made from diphtheritic membranes preserved dry in a piece of linen cloth for five months. The bacilli may live still longer in a moist state, and it is not improbable that the virus may retain its activity for a year or more in damp houses.

If people could only be made to realize these facts, they would be willing to isolate diphtheria as strictly as small-pox. Schools churches, theatres, hotels, public resorts, public conveyances, would be inspected and disinfected in times of epidemic. Strict isolation of patients would be insisted upon until the danger of infection is past; and such isolation would be made possible for the poor, for transients, and for those living in boarding-houses by the provision of suitable

hospitals for the sick and places of refuge for families while their rooms are being disinfected. It would be criminal for an infected person knowingly to use an ordinary cab, railway-car, or steamer, but at the same time suitable vehicles would be provided for the conveyance of such persons. There is no more interference with personal liberty in isolating a case of diphtheria or quarantining an infected family than in treating small-pox and yellow fever in a similar way. When the people are educated to the teachings of modern science they will realize the necessity of adopting stringent measures to limit the spread of infectious disease. Who are to be the educators, the apostles of light, if it is not the members of the medical profession? Each man in his own little circle, no matter how obscure or limited it may be, can be an educator, a civilizer.

In times of epidemic schools should be closed or a daily inspection of the scholars made by a competent officer. Particular care should be taken about re-admitting children who have just recovered from an attack of diphtheria. I have already pointed out how fallacious is the ordinary time-limit. The certificates which the children bring from their physicians, that they may return to school without risk to the other scholars, have no value whatever as a guarantee of safety. The physician cannot be supposed to have personal knowledge of the thoroughness with which disinfection of the house, clothing, and person of the child has been carried out, and probably has neither the requisite time nor skill to make a bacteriological examination in case of doubt. In the light of present knowledge I do not believe that a physician can conscientiously give a certificate, such as school boards generally exact, without the expenditure of much time and possibly a bacteriological examination. The only safe way is for school boards to insist in every case upon the applicant for re-admission bringing a certificate from the local health authorities that the requirements of the law have been fulfilled and that it is safe to return to school. School boards as well as health boards are servants of the people, and should act always for the best interests of the people. Both should co-operate heartily in dealing with an important question which is so closely bound up with the happiness and welfare of the community. Competent health officers should be appointed, not only to supervise isolation and disinfection, but also to make or obtain bacteriological examinations when required, inspect schools in time of epidemic, and grant certificates for the re-admission of convalescent scholars. In a word, the stamping out of a diphtheria epidemic is a matter of the gravest public import, affecting the interests of the whole community, and should be handled as such: private interests, feelings, rights, and prejudices must be subordinated to the public welfare.

In case of death from diphtheria the funeral should be private and arranged as speedily as possible.

(For the methods of disinfection of clothing and houses see the article on Disinfection in Volume I.)

ASTHMA, ACUTE AND CHRONIC BRONCHITIS, AND WHOOPING COUGH.

By JAMES T. WHITTAKER, M. D.

ASTHMA.

General Considerations.

Asthma is a paroxysmal dyspnœa caused by a peculiar catarrh, with spasm of the bronchi. The various lesions found by the pathologists in the earlier revelations of the dead-room and the disclosures made by physical diagnosis soon directed the causation of asthma to the organs found affected—thus, to the lungs by Bégin, to the heart by Broussais, to the brain and cord by Georgèt—until finally the very existence of the disease as an independent affection was denied altogether, as by Rostan, who regarded it as only a symptom of various affections.

The paroxysmal, if not periodic, occurrence and convulsive character of the attack had, however, from all time directed attention to the nervous system as the seat of the disease. Both Willis and Cullen, for instance, spoke of nervous asthma. But it was not until the appearance of the paper by Ramadge (1835) and the prize essays by Bergson and Lefèvre (1836) that asthma was really regarded as a neurosis of the respiratory organs—a view which seemed established by Romberg (1841), who based his conception of the disease, as a *spasmus bronchialis*, upon the discovery by Reiseissen (1808),[1] of muscular tissue in the finer bronchial tubes, and the contraction of these tubes under galvanization of the lungs by Williams (1840), and irritation of the vagus by Longet (1842).

The failure of both Budd and Rügenberg to produce contraction of the bronchi by irritation of the lungs and vagus led Wintrich (1854), who also failed, to propound the view that asthma depended upon spasmodic contraction of the diaphragm. For, he declares, the enlargement of the lungs in all directions is enough of itself to refute the idea of contraction of the bronchial tubes. The lungs ought to be smaller

[1] Reiseissen, F. D. R., graduated in Strasburg, 1803; thesis, "De pulmonis structura." The famous essay, *Ueber die Structur, die Verrichtungen und den Gebrauch der Lungen*, was written conjointly with Sömmering, and was awarded a prize by the Berlin Academy of Sciences, 1808.

in such cases. Less air is admitted, the diaphragm should ascend into the chest, the intercostal spaces become more marked; in fact, the diameters of the chest should be lessened in every direction. But the very reverse conditions prevail in asthma.

Bamberger, in 1870, brought to the support of this view a series of shrewd observations made at the bedside. He noticed during the attack the retraction of the lower zone of the chest, the board-like induration of the abdominal walls, and the almost absolute fixation of the lungs, so that the upper limit of liver-dulness did not vary a line in expiration, and there was no appreciable difference in the covering and uncovering of the heart by the lungs,—all of which declare positively for spasm of the diaphragm. As for spasm of the bronchial muscles under these conditions, it is, he declares, "improbable if not unimaginable."

At this juncture Biermer (1870) entered the list as the knight of the losing cause, which he succeeded in re-establishing more firmly than ever for a time. He fortified the physiological breach by appeal to the experiments of Paul Bert (1870), as subsequently verified by Gerlach (Ludwig) and Gillary (Donders), which demonstrated beyond dispute contraction of the finer bronchi under irritation of the lungs and vagus. Next he admitted the low level of the diaphragm, declares it in fact to be constant in this disease, but explains it as due not to tonic spasm, but simply to the distension of the lungs, which offers hindrance to its ascent.

There is such a thing as spasm of the diaphragm. Duchenne studied it in animals as produced by faradization of the phrenic nerve. It is marked by a brusque inspiration and a short expiration, with permanent dilatation of the lower thorax. Tonic spasm of the diaphragm is seen in tetanus, where it produces asphyxia, not asthma.

The distension of the lungs which prevents the ascent of the diaphragm in asthma is caused in turn by spasmodic contraction of the bronchial tubes. Very slight contraction of the bronchial tubes will markedly interfere with the escape of air from the lungs. A little thickening of the bronchial mucosa with accumulation of mucus produces the pronounced dyspnœa of capillary bronchitis. Hæmorrhage in the tubes leads to such great distension as to prevent collapse of the lung on opening the chest after death. True, the lung is not reduced in size in asthma. It is increased on account of its emphysematous state. But this is no argument against contraction of the bronchial tubes. Contraction of the bronchi would not reduce the size of the lungs. The whole lung must contract to have this effect. In asthma it is not a question of contraction of the lung, but of tubes inside the lung, which thus prevents the escape of air. For it is expiration rather than inspiration that is interfered with, hindered,

and prolonged. Four or five seconds of time are often consumed in expressing, with every strain, the air from the chest, while inspiration is effected in one or two seconds. There is no pause at all between the two.

Lebert, writing in 1873, is not willing to admit that all phenomena of asthma can be explained by contraction of the bronchial tubes. The dilatation of the air-cells, for instance, is not to be accounted for in this way. In capillary bronchitis the tubes are blocked, the obstruction is often profound, the dyspnœa may be terrible, yet there is no, or but slight, dilatation of the air-cells, and no, or but slight, immobility of the lower thorax. It is necessary to invoke the action of the diaphragm, as well as of other muscles of respiration besides those of the tubes, to properly explain an asthmatic paroxysm.

Weber in 1872 expressed the belief that other factors must coincide with the bronchial spasm to produce asthma. Chief among them is a sudden dilatation of the blood-vessels, with tumefaction and rapid exudation. Such a dilatation occurs in the experience of every one in acute nasal catarrh, often in hay fever, and leads to stenosis or actual occlusion. Riegel thinks that this view is supported by the experiments of Lovén, who demonstrated a reflex vascular turgescence in the domain of irritated sensitive nerves, and Störck supports this view by the demonstration with the laryngoscope of acute hyperæmia and tumefaction during the attack in the whole course of the trachea and bronchi as far as may be seen.

Whatever doubt still hung about the contraction of the bronchial tubes themselves would seem to have been finally dissipated by Lazarus (1891), who devised an ingenious apparatus wherewith he could, with the aid of curare and tracheotomy, experiment upon animals in life, and whereby he produced the characteristic dyspnœa of the disease by irritation of the vagus nerve.

Leyden in 1872 built a pier in the support of the bronchial-contraction theory, or a least contributed a solid block to differential diagnosis, in the discovery in the sputum of certain crystals, angular, elongated octahedrals, which might be supposed to be the active irritative cause of the attack. These crystals are found in grayish masses in the sputum, varying greatly in size, colorless or of a bluish tint, surrounded by masses of epithelium, and imbedded often in certain peculiar structures known as spirals. Some of them are distinctly visible with the simplest lenses, but they vary so much in size as to be manifest, some of them, only with higher powers, as with a Hartnack No. 8. These crystals are insoluble in cold water, alcohol, ether, and chloroform, but are easily soluble in alkalies, mineral acids, warm water, ammonia, and acetic acid; which plainly allies them to mucine, a form of which Salkowski declares them to be. They are identical with the

crystals discovered by Charcot in semen, which Klemperer has shown to be a phosphate of diaethylendiamin, and by Neumann in the blood and marrow of cases of leukæmia. They are most abundant during and after the attack of asthma. Friedreich and Zenker found them also in the fibrinous plugs of bronchitis, and Bizzozero and Von Jaksch saw them in bronchial catarrh without asthma. They have been observed also as curiosities in the fæces in cases of anchylostomiasis. Most interesting is the fact that Lewy found them in nasal polypi, but more especially in the pale grayish gelatinous masses in patients not affected with asthma. He could not find them in the hyperplastic tissues or tumors encountered in certain cases of asthma.

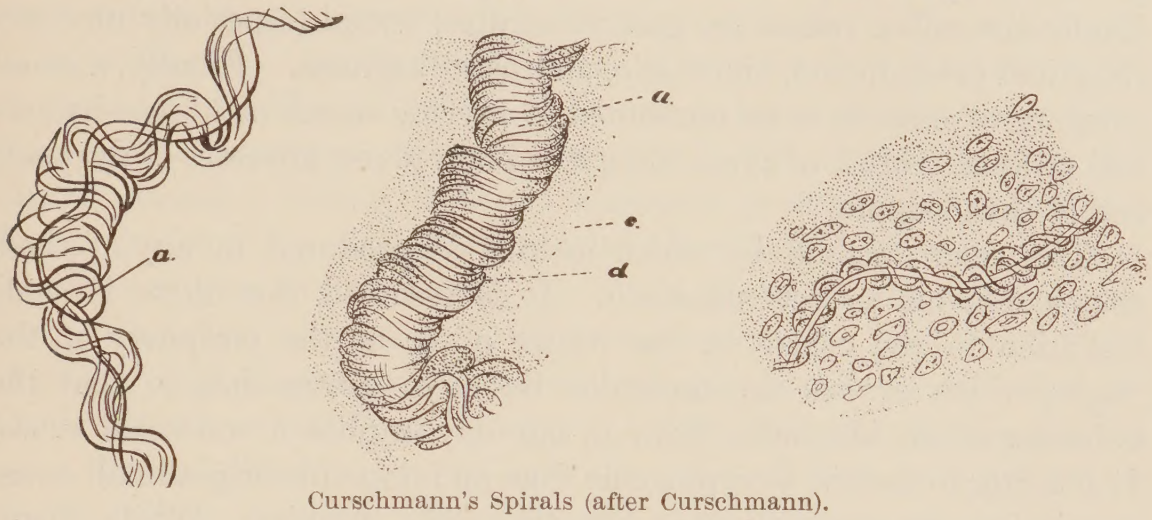
Fig. 35.

Charcot's Asthma Crystals (after Riegel).

Leyden in the same year made the discovery in the sputum of asthmatic patients of the certain peculiar spiral structures alluded to above, which Curschmann later more fully described and advanced as characteristic of bronchial asthma. These spirals, the so-called Curschmann spirals, exist also in the grayish masses found in the sputum, often in connection, as stated, with the Charcot-Leyden crystals in most frequent abundance at the beginning of an attack and in sharp, acute cases. They may be recognized even with the naked eye in their largest size, but are better defined with the microscope of low power as elongated spiral fibres grouped about a series of central and more open fibres, which present the appearance of a central canal. They exhibit, according to Vierordt, the finest forms of bronchial products, and hence correspond probably to catarrh of the smallest bronchial tubes (bronchiolitis exudativa). They are not exclusively present in asthma, but have been remarked also in croupous pneumonia and

tuberculosis. These spirals also represent forms of inspissated mucus. They are, like the crystals, products, not causes, of a peculiar bronchial catarrh.

Fig. 36. Fig. 37. Fig. 38.



Curschmann's Spirals (after Curschmann).

It has been remarked that the spirals exist in greatest abundance at the beginning of the attack, when the crystals may be entirely absent to present themselves in greater abundance later in the history of the disease. Indeed, crystals have been made to develop directly from or in the spirals in sputum protected for several days from evaporation. From the fact that both crystals and spirals have been found in other affections, they cannot be regarded as pathognomonic evidence of asthma, but there is no doubt of the supreme value of these structures in differential diagnosis; for in any case of dyspnœa the existence of either crystals or spirals in the sputum speaks emphatically for bronchial asthma. Revealed as they are by a glance under the microscope, search for them in a doubtful case should not be neglected.

Further corroborative evidence is furnished by cell-elements in the sputum. Müller demonstrated in the sputum of asthma numerous large lymphoid bodies with pale-yellow pigment-granules, which showed affinity or avidity for eosin, an acid aniline dye—the eosinophile cells of Ehrlich. Lewy found these same cells in nasal polypi, especially in the gelatinous masses with but little gland-structure.

Asthma has been reduced to two varieties—idiopathic and symptomatic, or primary and secondary. But it is doubtful if there be such a thing as idiopathic, essential asthma. Every year narrows more and more the number of idiopathic cases, with the discovery of some cause, immediate or remote, to account for the attack of the disease. These causes may be grossly divided into mechanical, chemical, and reflex, whereby many cases may fall under more than one head. Thus, among the mechanical causes may be cited goitre, the so-called thymic asthma, aneurism, trauma, foreign bodies, dusts (pollen, etc., grinder's asthma), rickets, disease of the vertebræ (Pott's disease), disease of the heart

(cardiac asthma), and certain diseases of the lungs, more especially bronchitis and tuberculosis. Under the chemical or toxic causes are renal, gastric, saturnine, mercurial, and malarial asthma and the asthma produced by odors, also cases of arthritic and tuberculous asthma. Under the reflex causes are gastric, cardiac, sexual (especially uterine), intestinal (verminous), traumatic, and nasal asthmas. Finally, a small category of cases is to be attributed to psychic causes or ideas—hysterical asthma. Most of these cases, it is plain to see, are cases of dyspnœa rather than asthma.

The exact method by which asthma is produced by any of these causes remains as yet unknown. It is assumed that there is some irritation in the centre, in the course of, or at the periphery of, the vagus, which excites the muscular tissue to contraction, so that the existence of an idiopathic form in our day implies a concealed cause. It is better to assume a cryptogenic than an idiopathic origin in all cases, if only because one stimulates, the other stifles, inquiry. While, therefore, it may be doubted whether there is such a thing as an asthma which is a pure neurosis—*i. e.* independent of an outside cause—it may be admitted that the sensitiveness of the nervous system differs in different people, and that certain individuals are more liable than others to attacks of asthma from the same cause. In other words, asthma implies unstable nerve-cells of easy explosion, and takes its place in nosology by the side of epilepsy, insanity, migraine, etc., with which indeed it sometimes alternates. It will be most in accord with modern medicine to look for the cause of the hyperæsthesia of the vagus in irritations caused by micro-organisms—diplococci, for instance, tubercle bacilli, etc. or ptomaïnes,—rather than in "heredity."

A few other etiological factors remain to be considered. First, heredity, which plays a very insignificant rôle in the production of asthma. Riegel observed of cases in which asthma was transmitted from father to children that the disease occurred in these cases at the same age as in the parents, and disappeared spontaneously at the same age as in the parent. It has been known to skip a generation, or, better put, to reappear in grandchildren. Age plays a more important rôle, in that, according to the statistics of Salter, of 153 cases one-fourth were under the age of ten, and four-fifths under forty years. Sex, social position, and vocation have less to do with the production of asthma. The disease occurs more frequently in males and rather more frequently in the luxurious upper class, but it is by no means rare among the poor. Teachers, clergymen, attorneys, people who lead sedentary lives, are rather more frequently affected.

Since Cullen made the first observation of the development of asthma in an apothecary's wife whenever ipecac was powdered in the shop, similar cases have been reported by most observers. There is, however,

an endless variety of materials which may evoke asthma in a patient affected with the asthmatic tendency. Thus the smell of a sulphur match, pitch, smoke, hay, tobacco, the rose, lily, and other flowers, coffee, and the odors of the kitchen, odors of certain animals—cats, rats, dogs, horses, rabbits, guinea-pigs, chickens; the odors of wild animals, as in menageries,—precipitate attacks. Literature is full of curiosities in this regard. The proprietor of an equestrian establishment suffered from asthma continuously until he retired from business, when the disease ceased, to return, however, whenever he returned to his horses. Fagge speaks of the case of a lady who was affected whenever she came into a room in which was a cat, no matter where the animal was hidden. Ramadge tells the story of an employé in the East India Company who had to give up a lucrative appointment because the smell of tea developed an attack of asthma. Austin Flint was unable to sleep on a feather pillow. In one case the odor of roses brought on an attack, and so sensitive was this lady as to suffer a seizure on one occasion, though the rose which was held before her was artificial.

The frequency with which an explosion of asthma has occurred in consequence of real odors should have sooner led to the investigation of the nasal cavity for sensitive areas. Voltolini long ago made the observation that asthma may be produced by a polypus in the nose. In one of his cases removal of the polypus relieved the asthma, which returned with the recurrence of the growth, to disappear again with its extirpation. These observations have been abundantly confirmed by observers, many in our own land—first by Hænisch, and more lately by Hack, Roe, Harrison Allen, and Bosworth; so that at the present time the tendency is to exaggerate the importance of the naso-pharyngeal genesis of asthma or to consider that the disease results exclusively from this cause. According to Schmiegelow, asthma has a nasal origin in 30 per cent. of cases—*i. e.* polypus 22, rhinitis 8.

Errors, more especially excesses, in diet frequently excite an explosion of asthma. Attacks limited to certain days of the week can generally be traced to this cause. The peptic asthma of the old writers were reflected indigestions, better explained in our day by gastric distensions and interferences with the circulation.

Colds account for the many cases associated with bronchitis. These are the cases in which attacks occur after every exposure. It is needless to say that the cold was caught in the majority of cases in the crowded, badly-ventilated room before the exposure of the return journey. Regarding the relations of tuberculosis and asthma, there is a note later on.

Locality is a factor of etiology which cannot be overlooked. It has long been remarked—and the point was especially emphasized by Salter—that some patients who live in the country get absolute exemp-

tion from attacks during a stay in the city. The immunity seems to be more assured or absolute as the air of the city is vitiated by soot, and more especially by fog. London excels in this regard. Thus patients have come from the country to consult physicians in London, waiting for the development of an attack which never occurred, and have returned home in the belief that the disease was cured, to be attacked on the night of their return. And many patients must make a regular habit of visiting the cities at stated intervals or must make a permanent change of residence.

To sum up with regard to the etiology of asthma, it may be stated that the disease requires three factors: first, bronchial spasm; second, bronchial catarrh, which, however, may be entirely absent in an individual case; third, hyperæsthesia of the vagus nerve, which must always be present, and which constitutes what is known as the asthmatic tendency. In such a case an irritation anywhere at the periphery of a sensitive nerve may be reflected to the vagus to produce bronchial spasm. A not infrequent source of irritation is the uppermost portion of the respiratory tract—to wit, the nasal mucous membrane—and it is the middle and lowest portion of the nasal fossa, that about the turbinated bones, that the relation of this irritation is most frequently observed. Thus, the removal of polypi from the inferior meatus has cured a case of asthma, while other and even numerous polypi still remained in the upper nasal passages. Hyperplastic mucous tissue, adenoid tissue, hyperæsthetic areas, bony occlusions, irritations, or stenoses of any kind or cause in this portion of the respiratory tract, are the most prone to produce asthma. It is undeniably true that these conditions may exist without the production of asthma. It is equally true that some one of these conditions can be found in a large number of cases. Irritations about the larynx, especially of the interarytenoid folds, are much less frequent causes. Glasgow made an interesting confirmatory observation of such cause by the accidental application of a concentrated solution of carbolic acid to the larynx for some local affection, when the asthma from which the individual had suffered severely for years disappeared, never to return.

True asthma—that is, the pure nervous asthma, by which is meant asthma without discoverable cause—is, as a rule, sufficiently easily recognized. The age of the individual, the time of its occurrence —*i. e.* during the night—the suddenness of its onset, the intensity of the dyspnœa, above all things the difficult expiration, the sibilant and sonorous ronchi, the great anxiety, the struggle, the "*Lufthunger*," with the gradual cessation to complete relief and the free interval, unmistakably stamp the disease.

The diseases which most closely simulate asthma are—first, affections of the larynx, spasm of the larynx, false membrane, and œdema of the

larynx, to which may be added tracheal stenosis. But in all these cases the difficulty is with inspiration, not expiration. Inspiration is a long, powerful stridulous struggle; expiration follows easily. There are no wheezing sounds in the chest. The condition is often recognized with the laryngoscope. The onset of laryngeal affection is always more gradual; artificial relief is never so abrupt. Spasmodic contraction of the adductors or paralysis of the abductors shows the same inspiratory dyspnœa. Laryngismus stridulus is closely allied to asthma. It is also a neurosis with little or no associated catarrh. Paralysis of the posterior crico-arytenoid muscles is easily recognized with the laryngoscope. The vocal cords are found approximated or separated by only a narrow chink. Œdema of the larynx occurs in consequence of acute laryngitis, or of disease of the kidneys or lungs. Tracheal stenoses, unless due to foreign bodies, where the history is plain, are caused by neoplasms, syphilitic or carcinomatous, or by aneurisms or by goitre—conditions readily recognized by simple inspection or by evidences elsewhere in the body.

Certain diseases of the lungs, more especially bronchitis and emphysema, resemble asthma in the fact that the expiratory dyspnœa predominates. It is often difficult to distinguish between asthma and emphysema because of their frequent coexistence. Asthma produces emphysema, yet either may exist without the other. The emphysematous patient has the configuration and habitus of the chronic asthmatic. The dyspnœa is more or less continuous; it is aggravated by exercise, excitement, emotions. Its exacerbations, which simulate asthma, attack the patient more therefore when he is awake. True asthma occurs for the most part in sleep. The wheezing sounds are not so abundant in pure emphysema as in pure asthma. Crystals and spirals, eosinophile cells, rare in emphysema, occur as a rule in asthma. Intermission is the rule of the dyspnœa in asthma, remission in emphysema.

Bronchitis distinguishes itself by its more gradual, never sudden, onset—by its more abundant cough and expectoration, which, at first mucous, may become purulent—a change which never shows itself in asthma. In bronchitis the wheezing sounds, although sometimes universal, are confined more especially to the posterior inferior lobes of the lungs. They are never so intense as in asthma. There is more or less fever—absent in asthma—in acute diffuse bronchitis, which form alone resembles asthma.

Dyspnœa from heart disease closely simulates asthma at times. Here too, however, the dyspnœa is more strictly dependent upon exercise or cardiac activity. In cardiac dyspnœa there is evidence of heart disease. There are valvular murmurs, accentuations, hypertrophies, irregularities in rhythm, and general dropsies. The disease does not set in suddenly or subside suddenly. There is not

the same wheezing in the chest. The dyspnœa may become profound in cardiac disease, more especially in the later stages, in consequence of œdema of the lungs. Œdema of the lungs does not, however, show the same degree or the same kind of dyspnœa. Respiration in it is more shallow and superficial. It is not so much a question of obstruction as of infiltration. The expectoration is more profuse, watery, and is often tinged with blood.

Spasm of the diaphragm shows quite a different picture. There is a sudden abrupt inspiration, often attended with hiccough and forcible fixation for a few seconds, then a quick, violent expulsive effort. Spasm of the diaphragm is best seen in tetanus.

Intercostal neuralgia, which restricts the action of the respiratory muscles, may be distinguished by its painful points and by its pain in general. There is no wheezing cough, no expectoration. Embolism of some of the branches of the pulmonary artery sometimes resembles asthma. Embolus is found in connection with heart disease. Respiration becomes suddenly irregular. There are intense anxiety, often expectoration of blood, profound dyspnœa, which differs from asthma in affecting both inspiration and expiration, marked prostration, and not infrequently sudden death. Often there is evidence of embolus elsewhere.

Asthma having been recognized and differentiated from dyspnœa caused by affections of the larynx, lungs, or heart, the question presents itself: What is the form of asthma, primary or secondary? This question is by no means easily answered; it involves often an examination of all the organs of the body, especially of the avenues of respiration, disease or irritation of which might by reflex process excite the vagus nerve; and it is only when such disease is excluded that we are justified in considering the case as primary asthma.

Treatment.

The treatment of asthma resolves itself into two problems: to cure or cut short the attack and to prevent its recurrence; in other words, to treat the paroxysms, and to treat the patient in the intervals between the paroxysms.

The patient should be placed first in a comfortable position, which, indeed, he himself usually seeks. There should be allowed the same latitude of disposition of the body in the paroxysm of asthma as in the pains of parturition. Tight clothing should be loosened, free ventilation secured, officious ministrations avoided. To sit up in bed with the elbows upon the knees elevates the shoulders from the chest and gives additional points of support to the extraordinary muscles of respiration. This posture is usually taken at once. Many patients get this relief sitting in a chair with the elbows supported upon its arms;

others kneel with the elbows upon the chair or side of the bed, or seize the framework of the bed, or stand with the hands grasping the mantel or the elevated sash of the window. Individuals have found some comfort by supporting the shoulders on short crutches by the side of a chair, and various apparatus has been devised, arm-chairs with special supports or head-bands and shoulder-supports swung from the ceiling—different postures for different individuals.

Should the attack be clearly due to indigestion, stomachic or intestinal, the quickest means of relief is by an emetic or an enema. A cardiac or a renal asthma is often quickest relieved by a hot bath. Offensive odors, animals, flowers, feathers, drugs, should be removed at once, or the patient may be removed from their vicinity. The mere lighting up of a dark room at night sufficed to relieve Trousseau.

As a sort of routine practice, inhalations are used by the patient himself at the onset of the signs, and the treatment may begin with mention of them.

The fumes of saltpetre have been used for fifty years, and probably no single remedy has so wide a range of utility. It is, as Salter remarked, always a matter of surprise to learn that an individual has not tried this drug. Often it fails from improper use. The patient may make the solution himself, or buy it prepared, alone (*chartæ potassii nitratis*) or with other drugs. Ordinary blotting-paper, not too thin or too thick, is dipped in a warm saturated solution of saltpetre, dried, cut in squares or strips, and ignited, the patient breathing the fumes as they arise. The room should be small—a closet with a partly-opened door, a seat under an umbrella, or a tent of bed-clothes over a chair—to substitute the curtains of the old four-posters, which we now rarely see. It may be inhaled in any desired strength from under a funnel. If it is to act at all, it acts quickly, usually exciting some cough at first; breathing becoming easier in a few minutes. Patients use it also as a preventive, inhaling the fumes for a few minutes before retiring or just after retiring, or they leave the strips in easy reach to be ignited with the first manifestation of symptoms. There are patients who rather prefer not to go to bed at all than to have to dispense with the fumes of nitre. It should be used at the very beginning of the attack. Sometimes it gives but partial relief; sometimes it succeeds at first and fails later; sometimes it fails utterly. Nitrate of potassium parts with oxygen readily, and it is believed that its virtue in asthma is due to the nitrite which is left. The older practitioners use it also freely internally in doses of 20 grains, with 20 or 30 grains of the carbonate of potassium, in a tumbler of water three or four times a day.

Stramonium is a still older remedy, having been introduced from India in 1802. The stramonium most in use in our country is the

leaves of the common Jamestown weed dried and ignited, or preferably rolled in the form of a cigarette. Stramonium may reach cases in which nitre fails. The converse is more frequently true. Stramonium is a more dangerous remedy. The danger is obviated by a cessation with the first confusion of sight or intellect. Both nitre and stramonium sometimes fail completely. They are more likely to succeed in toxic or purely bronchial cases, and fail in every way in nasal or naso-pharyngeal cases.

Coniine, hyoscyamine, and hyoscine are remedies which have been used as substitutes for stramonium, but they succeed only in the most exceptional cases and in the face of greater dangers. More may be claimed for atropine. Belladonna was the favored remedy of Trousseau, who recommended that it be used for a long time with occasional intermissions. Lenhossék, Harley, Salter, each advocate it strongly. Its best effects are obtained when used in a grain-to-the-ounce solution, beginning with from 2 to 5 drops, and pushed gradually to tolerance. It should be given at bed-time, to anticipate the onset of the disease in the early morning.

The remedy which has the most sovereign control over the greatest number of cases is morphine subcutaneously. Morphine rarely fails to abort an attack of asthma. It should be given in doses of from $\frac{1}{8}$ to $\frac{1}{4}$ grain. Some of its evils may be counteracted by admixture with $\frac{1}{100}$ or $\frac{1}{120}$ grain of atropine. Morphine would be used universally were it not for its unpleasant after-effects. It nauseates some patients, and disturbs the digestion of nearly all patients. It produces discomfort for the whole of the following day. Most patients prefer rather to suffer an attack of asthma during the night than to endure the discomforts of morphine and disqualification for work for the whole of the following day. Then, too, morphine has the disadvantage that it soon begets tolerance. The dose must be gradually increased. There are authors who maintain that it is better to suffer the evils of morphine than the damage which protracted paroxysms of asthma produce. There are individuals who learn to use the remedy only in the worst attacks, and thus are not obliged to increase the dose. Stevenson in five years never increased the initial dose over $\frac{1}{6}$ grain, with uniform success. It is not good practice to resort regularly to morphine: morphine is to be used as a *dernier ressort.*

Next to morphine—in the estimation of many practitioners, far above it—stands chloral, which often, indeed, "acts like a charm." Chloral is given in large doses, 15 to 40 grains largely diluted, at once, rather than in small doses frequently repeated. It acts quickly, relaxes the spasm, and gives the indescribable relief of a full breath in the course of five or ten minutes. No remedy has received higher

praise; no remedy is more satisfactory in most cases; no remedy fails so utterly in many others, for when it fails it aggravates the case. It acts best in those cases which seem to be more strictly idiopathic. It acts worst in heart disease, where it is even dangerous. It is certainly not good practice to resort indiscriminately to chloral. The drug does not deserve the praise lavished upon it a decade ago. It falls short if only because it fails to address the cause. It leaves the nervous system weaker than before. Yet both morphine and chloral are indispensable in certain cases. The practitioner must decide for the individual case.

It is the experience of the writer that his most intelligent patients refrain from or decline the use of either chloral or morphine. If they can get relief from no other agent, they will, as a rule, endure the ills they have, convinced of relief by nature in time.

To most patients relief, sometimes absolute, more frequently partial, but relief enough for sleep, is furnished by the use of some one of the antipyretics—antipyrine, antifebrin, phenacetin, or quinine. For an adult there is usually required, at a dose, of antipyrine 10 grains, of antifebrin 5 grains, of phenacetin 15 grains, of quinine 10 grains; and one such dose at bed-time or at the beginning of the attack will, as stated, usually suffice at least to modify the attack.

Chloroform acts more quickly than chloral, and there is no case that will resist inhalations of the drug. Unfortunately, the good effects of chloroform do not persist. The symptoms return after the cessation of its use. Sometimes, however, a few whiffs of chloroform permanently cut short an attack. It is astonishing with what impunity chloroform may be inhaled in asthma when administered by skilful hands. It does not seem to have the same contraindications as in other affections. Chloroform can be used in asthma with the same impunity as in parturition, probably from the same cause. Chloroform is dangerous when patients use it themselves, and fatal accidents have often occurred in this way. Where patients are compelled to use it themselves, four or five drops should be let fall upon and inhaled from a handkerchief. Other anæsthetics of equal or nearly equal value are ether, iodide and bromide of ethyl, the nitrite of amyl, and pyridin. All these remedies are to be inhaled in the same way from a handkerchief, except that pyridin is better administered by being poured—a dozen drops—upon a hot plate and inhaled in a small room or closet. The author has read and heard of many striking and marvellous accounts of the value of pyridin, but has never seen it succeed in a single case. It may be said of all these succedanea that they are of value only in the milder cases, and that they will fail entirely in the majority of cases. And it may be said of chloroform that, while it may be inhaled in small quantities without danger, it becomes so dangerous in large quantities, often in sufficient

quantity, and of such temporary value in all quantities, as practically to exclude its use.

In the case of fatty heart, where there is decided contraindication to chloral, paraldehyde has been used as a substitute, best administered with the tincture of orange-peel.

The fumes of sulphur and of arsenic have been used from the days of Fracastorius, and may be tried in desperation after all other remedies have failed. Of the powerful modern remedies used to abort an attack, may be mentioned nitro-glycerin subcutaneously, 1 to 3 drops in a syringeful of water; strychnine, $\frac{1}{50}$ grain; atropine, $\frac{1}{150}$ grain, both subcutaneously. Occasional cases yield to exceptional drugs.

Tobacco is a drug that has no superior in persons who are not accustomed to its use. The profound nausea that is caused by the smoking of tobacco stops asthma like the wave of a magician's wand; and this may be said of any agent that has the same effect, as of antimony and lobelia. Nausea is the enemy of asthma as of any other spasm. Unfortunately, the remedy cannot be used by most males because of tolerance, and by most other people because of the extreme suffering which intense nausea means. There are many individuals, however, who have learned to smoke to protect themselves against asthma, who have remained free from the attacks so long as they have used tobacco. But it is true of the majority of cases that the asthma will assert itself so soon as tolerance is established. Most patients prefer the distress of severe asthma to intense nausea, and are driven to the use of emetics—ipecac by preference—only because experience has taught them the futility of everything else.

Of all the agents which suddenly control asthma, none is so effective as a profound mental emotion. Whether pleasurable or painful, the effect is the same; but the emotion must be intense. It must be in the nature of a shock. A sudden surprise, excessive joy, grief, fright, a cry of fire, may cut short an attack at once. Knight tells the story of an asthmatic who was relieved at once in playing cards so soon as the stakes grew high.

The truth is, that the use of antispasmodics and anæsthetics is justified only in intensely acute cases, as those are wont to be which occur at long intervals, or in prolonged cases which continue severe. Milder cases, average cases, will content themselves with saltpetre-paper, a stramonium cigarette, a dose of antipyrine or quinine, a single dose of Dover's powder—at most a light emetic dose of ipecac, lobelia, or apomorphine—awaiting the relief which may be expected of the treatment of the cause.

The success of the treatment of the interval, the prevention of the recurrence of attacks, depends upon the ability to discover and remove the cause. In a certain percentage of cases the cause may be discovered

in the nose, and removed by the use of astringents, emollients, boric-acid ointments, more especially caustics, chromic acid, above all, the galvano-cautery, the extirpation of polypi, the reduction of hyperplastic tissue, the destruction of sensitive areas as localized often by 10 to 15 per cent. solutions of cocaine. All these methods have been followed by results as satisfactory as could be desired; this, too, in cases where other treatment has been tried for years. Adenoid growths in the naso-pharynx, affections of the tonsils, cicatrices, ulcers, various affections of the pharynx, more rarely of the larynx, trachea, and bronchi, have all served as excitants of the explosions of asthma. Tuberculosis in its earliest or least advanced stage is, in the opinion of the writer, an occasional cause of the so-called pure asthma.

Ducros recommended as a specific the application of ammonia to the pharynx—a treatment which is applicable to only a few individual cases. Trousseau used inhalations of ammonia with benefit in some cases. Dieulafoy paints the throat or sprays it with cocaine, 1 : 20.

The remedy which enjoys the highest repute in the treatment of asthma in general, without reference to discoverable cause, is the iodide of sodium, or, preferably, the iodide of potassium, in gradually increasing doses. The patient may begin with 10 drops of the ounce-to-ounce solution, and increase it to intolerance as manifested by coryza, with, in most cases, the most beneficial results. Of all the remedies which have been used in asthma, none deserves so much praise as the iodides, probably because they address a hidden cause, which may be enlarged glands, cervical or bronchial, irritating the vagus nerve. Every practitioner may recall individuals who remain free of attacks of asthma so long as they are under the influence of an iodide. It is the remedy which is to be tried first and longest. Large doses are best administered in milk. It is a rare case of pure nervous asthma,which is not at least benefited by the iodide of potassium, and many cases are actually cured by the persistent use of the drug.

Next is arsenic, which should also be given in gradually increasing doses up to the point of tolerance; then reduced, and continued in smaller dosage over long periods of time. Arsenic has manifold testimony as to its virtue. It was the remedy most relied upon by the older practitioners.

Quinine is of signal value in individual cases. It is best adapted to those varieties of the disease which show some periodicity or recurrence.

Leyden, finding that the crystals discovered in the sputum of asthma were soluble in the chloride of sodium and carbonate of sodium, recommended the inhalation of 1 part of each of these agents in 100 parts of water, twice daily in the form of spray. Fauth says that the carbonate of ammonium liquefies the spirals. He finds it of value, there-

fore, in the therapy of asthma. Little could be expected from the use of this remedy with our present knowledge of the relation to asthma of these structures.

Strychnine has its advocates in the form of solution itself or in the tincture of nux vomica given in small doses for weeks or months continuously. It has been followed in individual cases with good results.

Salter speaks highly of the use of alcohol in certain cases. It must be given hot and strong to be of any effect. Saturation with the bromides, as in the treatment of epilepsy, is perhaps the most efficacious treatment in aggravated cases.

It has already been intimated that many patients are relieved absolutely by change of climate. In this regard also asthma has its freaks. Patients in the country are relieved by going to the city, and patients in the city are relieved by going to the country; patients in valleys by mountain-air, and patients in the mountains by descending to the valleys. A moist, humid air will relieve most patients. Asthmatics are more often benefited at the seaside than in the mountains. So capricious is asthma that change of sleeping apartment from the ground floor to the upper story, or *vice versâ*, may have the same preventive effect. The truth is, the patient must find his own climate, must sometimes make changes, and must remain as long as he may in the climate which is best for him. Florida, Southern California, the Bermudas, Nassau, the sea or its coast, and the inland lakes, are points of selection.

Oxygen and compressed air are other resorts in the treatment of this disease. Patients are made to inhale compressed air in stationary rooms or portable apparatus for hours at a time—sometimes to effect a cure, oftener to give temporary relief, often to fail entirely. As a general rule, it is best to inhale compressed air and exhale into rarefied air. Those cases are most benefited which are most dependent upon bronchial catarrh. Asthma *per se* is little or but temporarily affected by pneumatic therapy.

The induced current of electricity—electrodes at the inner border of the sterno-cleido muscle, and sessions of from ten to fifteen minutes—has met with renewed advocacy by Schmitz, and has proven of value in exceptional cases.

No attempt will be made here to enumerate all the remedies which have "proven of benefit" or "acted like a charm" in cases of asthma. Pure asthma is too seldom accurately isolated from organic disease to enable us to define the action of drugs, and sorcery applies in our day to so few cases that, aside from a few plain principles, we are reduced to empiricism in the treatment of the disease. The aphorism of Bacon has application here: *Vere scire est per causas scire.*

BRONCHITIS.

General Considerations.

Definition.—Inflammation, for the most part infection, of the bronchial tubes.

Bronchitis is the most frequent of all diseases. It constitutes three-tenths of all internal maladies. It affects all ages, with especial predilection for both ends of life. It increases in frequency from the equator toward the poles. It is recognized in forms acute and chronic, circumscribed and diffuse, ascending and descending, with varieties according to the character of the secretion and the condition of the bronchial wall; but the division which has chief interest is into primary and secondary, the so-called idiopathic and symptomatic forms.

It is easy to understand the origin of cases of primary bronchitis caused by the action of irritating or irrespirable gases or dusts. Individuals employed in factories for the production of ammonia, chlorine, iodine, bromine, or strong mineral acids show occasional attacks of bronchitis until the mucous membranes become habituated to the action of these agents. So, too, it is easy to understand bronchitis or tracheobronchitis which results from the inhalation of steam, from the irritation of dust. Thus, engineers, bakers, millers, stonemasons, miners, brushmakers, polishers, housemaids who are engaged much in sweeping, furnish another contingent of cases of bronchitis. But the vast majority of cases of primary bronchitis arise independently of all these conditions, and are commonly ascribed to the process of taking cold.

Secondary bronchitis develops in consequence more especially of the infectious diseases. Bronchitis belongs to measles, to small-pox, and to typhoid fever, and constitutes an integral symptom of these diseases. Bronchitis is also frequently found in connection with diphtheria, universally in connection with tuberculosis, almost universally, at least periodically, in association with emphysema. There is also more or less bronchitis in pneumonia and pleurisy. Inasmuch as bronchitis shows itself in the infections in the first part of the malady, it is fair to assume that the poison of the disease lodges in the bronchial tubes in its reception into the body. The acute exanthemata are believed to arise from a *contagium vivum*, and bronchitis is the first expression of the irritation of micro-organisms, as a diarrhœa results from the action of intestinal parasites.

Secondary or symptomatic bronchitis occurs also in connection with mechanical disturbances of the circulation—that is, of nutrition of—the bronchial mucous membrane. Bronchitis belongs to the later stages of heart disease, and shows itself in intensity in correspondence with the damage done to the heart. Thus, bronchitis is more or less

universal in tricuspid insufficiency. For the same reason bronchitis occurs in the course of cirrhosis of the liver or the kidneys. Every form of kidney disease which results ultimately in heart failure is attended with bronchitis. Bronchitis may arise also mechanically in the course of ascites or tumors of the abdomen of rapid course which interfere with the action of the diaphragm.

The bronchitis which belongs especially to the chapter of bronchial catarrh is the malady which begins in the bronchial tubes and which is ascribed to taking cold. "Catching cold" is really only a synonym for contracting disease, for bronchitis does not result from any change of temperature. Individuals plunge heated into a cold bath and emerge without bronchitis. Bronchitis is rare in the coldest regions; it is almost unknown in the Arctic zone. So also bronchitis is almost unknown in the prairies, in the open sea, at the tops of mountains—places where the air is rare and cold, not because the air is cold or rare, but because it is more pure. Colds are caught in doors, not out of doors. It is safe to say that most cases of bronchitis result from the action of micro-organisms of very great variety. Thus, it is known that typical bronchitis occurs in connection with tuberculosis and pneumonia. But that bronchitis may result from the action of micro-organisms indirectly, and be due rather to their products than their presence, is shown in the typical bronchitis of typhoid fever, which is caused by a bacillus that is never found in the bronchial tubes. Individuals who live in the outdoor air and who are subject to the greatest exposures, the most marked vicissitudes of weather, seldom suffer from bronchitis. Sailors have bronchitis on shore, not at sea; soldiers in barrack-life; inhabitants of cities rather than the inhabitants of the country.

Geigel states that more illegitimate than legitimate children suffer and die from diseases of the alimentary canal, but that more legitimate children die of diseases of the respiratory tract. Illegitimate children die from neglect, bad food, and legitimate from coddling and confinement to the house, protection from every exposure. House-air as contaminated by closed windows, ill-ventilated compartments, more especially by crowds in tenement-houses, public assembly-rooms, concerts, theatres, etc., schools and kindergartens, court-houses and post-offices, public buildings where men congregate and where the products of men accumulate,—these are the breeding-places of bronchitis. So the "cold" which is manifest on return from the theatre or the ball-room, if not present in latent form before, was caught in the room and not on the way home.

One of the most valuable acquisitions of our day in reference to bronchitis is the frequency with which it is caused by or is the manifestation of tuberculosis. Many cases of tuberculosis never go beyond

the stage of bronchial catarrh, which may show itself in exacerbations and remissions, the real nature of which is only discovered by an examination of the sputum. Statistics, such as are furnished by oculists in the examination of the eyes of children, when brought to bear upon the examination of the sputum of the school-room or of the workshop, the public hall, may alone show how widespread is the catarrhal tuberculosis which is now known in most cases simply as an innocent bronchial catarrh.

Acute bronchitis shows but few morbid changes, however diffuse the disease or distressing the symptoms. The condition fades, to leave no trace. The morbid anatomy of acute bronchitis is best studied during life, where it may be seen in the beginning of the bronchial tree. It has been abundantly observed that the same hyperæmia and swelling of the bronchial mucous membrane extends into the bifurcation of the bronchial tubes and into the body of the tubes as far as can be seen. It is seldom possible to see much farther than the bifurcation of the bronchial tubes. At this particular part the signs of inflammation are pronounced. There is more or less diffuse redness, distinct swelling, even tenderness to pressure from the outside, which pressure will at times beget an exceedingly irritating prolonged cough. A tough, tenacious mucus covers the surface. In more chronic cases the mucous membrane is more distinctly hypertrophied, more especially discolored to assume a slaty hue. Pigment deposits are found more or less abundantly distributed throughout the bronchial mucous membrane. Patches of atelectasis occur in connection with the emphysematous process in the vicinity.

Scarcely any disease varies more in intensity than bronchial catarrh, from the lightest grades of inflammation, confined to the mucous membrane of the trachea and main branches of the bronchial tree, which hardly show any symptoms at all, at least in adults, to more or less universal involvement of the finer tubes, with more or less complete occlusion, and hence dyspnœa, suffocation, convulsions—the picture of capillary bronchitis, with all intervening grades of intensity. Thus, the disease presents totally different aspects. Inflammation confined to the trachea and large bronchi furnishes, as a rule, in adults, but few symptoms. Constriction, irritation, a sense of rawness, more especially a sense of tickling, usually relieved by a sharp cough, which literally scratches the mucous membrane in this region, slight expectoration of tough, tenacious mucus, few or no constitutional symptoms, —this is the picture of ordinary bronchial catarrh as seen in adults. It does not in any way incapacitate the individual for work or, as a rule, call for the use of drugs. In childhood and advanced life the picture may be quite different, even though the disease be limited to this region. The narrower calibre of the tubes in childhood produces

a greater degree of stenosis, and the muscular failures of senescence lead to the accumulation of mucus, epithelial débris, etc., which may be aspirated into the deeper parts of the lungs, to lead here to symptoms of capillary bronchitis or catarrhal pneumonia. In childhood in these cases the cough is much more severe, the breathing more frequent, the distress from insufficient aëration of the blood more apparent. Duskiness of the face, cyanosis, somnolence, convulsions, coma, may occur in these cases, and are especially wont to occur where the individual is already debilitated by tuberculosis, syphilis, or rickets. The symptoms assume intensity in all cases as the disease attacks the finer bronchial tubes, until finally, when it invades the finest tubes, the so-called capillary bronchitis, the case assumes the gravity of real catarrhal pneumonia. In fact, the diagnosis between these diseases is wellnigh impossible.

Capillary bronchitis is recognized by the frequency of breathing, the respirations increasing to from 40 to 80 in a minute, by the increase in the fever, which shows temperatures ranging from 102° to 105°, by increase in the pulse-rate, 160 to 180, in correspondence with the elevation of temperature. Notwithstanding the increased frequency of breathing, dyspnœa becomes more and more pronounced, the occlusion of the bronchial tubes leads to atelectasis, and the lung can now no longer follow the excursions of the chest. This limitation of movement becomes apparent with every act of inspiration. The supra- and infra-clavicular fossæ, the intercostal spaces, the region about the insertion of the diaphragm, and the whole lower zone of the chest retract, and sink with every act of inspiration. It is thus established that the lungs themselves, blocked in their bronchial tubes, remain more or less immobile. The defective expansion is shown more distinctly in defective aëration of the blood. Cyanosis, which reveals itself first to the practised eye about the lips, spreads gradually over the face; the finger-nails assume a bluish tint. In the course of a few hours or a few days the extremities, then the whole body, become more or less distinctly dusky or blue. The anxiety of the patient becomes intense. Hereupon ensues the pitiable struggle for air, the silent, pain-inflicting appeals to relatives for relief. As the cyanosis increases the sensitiveness of the nervous system becomes gradually more obtunded, the struggle for air is less pronounced, the condition of excitement gives place to apathy, and there is at this time an apparent but illusory improvement. Convulsions ensue at any time during the course of this stage. Comatose states, sudden heart failures, put a merciful end to the scene.

The lighter forms of bronchitis show no physical signs on inspection. The chest movements are not inhibited. There is nowhere any consolidation. The air still finds access to the recesses of the lung, so that auscultation may disclose no sign of the disease. This is especially

the case in the tracheo-bronchitis of adults, which is revealed only by subjective signs, and more distinctly by the laryngoscope, when the lining of the membrane of the trachea may be seen to be inflamed, the disease concentrating itself more especially at the point of bifurcation. Here, however, as elsewhere, the tubes may be silent so far as physical signs are concerned. In the middle-sized tubes the diagnosis often rests upon the physical signs. This is more especially true of the differential diagnosis. There is still no limitation of the excursions of the chest. The chest-walls still rise and fall to the same degree as in the normal state. Mensuration shows no difference. No sign is yielded to percussion. Even slight lobular consolidation, more especially if central, may escape detection by percussion. All the more rich in signs is auscultation. As a result of thickening of the walls of the tubes an obstacle is offered to the entrance of air, and coarse groaning, humming, sonorous ronchi pervade the chest. What distinguishes them as belonging to this disease is not so much their character as their distribution. They are heard not only below the clavicles, but over the whole of the anterior surface of the chest—in the lateral regions also, posteriorly behind the clavicles and below. These dry râles are indicative of the stages of hyperæmia and occlusion by the swollen mucous membrane. They give place in the course of twenty-four to forty-eight hours to moist sounds produced by the exudation of fluid. Every variety of moist sounds may be heard in the chest, from the coarse mucous râle to the finest crepitation. It is here, again, not so much the character of the sound as its wide distribution which is characteristic of bronchitis. The râles are symmetrical; they occur in both lungs; they are confined to no particular region of the chest. What, again, distinguishes them is the fact that they appear and disappear. A more profound inspiration or expiration, more particularly a sharp cough, may change the râles from moist to dry, or dissipate them altogether for a time. Then they recur. The universality of the râles, their fugacity, their change in character, distinguish bronchitis from diseases which may show the same signs at certain periods or at certain places.

Capillary bronchitis is recognized for the most part by obvious signs. The frequency of breathing, the dyspnœa, the cyanosis, the fever, the nervous anxiety, above all things the retraction of the chest on inspiration, distinguish capillary from coarser forms of bronchial catarrh. In capillary bronchitis, which runs a more latent course, there is usually a history of catarrh which comes and goes, which seems more directly dependent upon the weather, which is present in the winter to disappear in the spring, or whose presence or absence may be determined by change of residence. There is a cough which remains unnoticed because of its long continuance. Old men have a coughing "spell" in the morning every day for years, and then are

compelled to cough little or not at all during the rest of the day. They must expectorate the mucus which has accumulated over-night. The disease is more or less continuously present in these cases, but is subject to exacerbations and remissions, and it is only when the exacerbation is attended by marked signs, as by increased fever, more violence of cough, pains in the limbs and joints, that the individual will say he has caught a fresh cold, and attention is directed to the disease. Not infrequently, the disease is recognized by the conscientious physician, who makes a thorough examination of the body in the hope of discovering somewhere a latent cause for the symptoms of prostration. In other words, a capillary bronchitis in general has the same history as a catarrhal pneumonia. There may be in cases no dyspnœa, no anxiety, merely an increased weakness, which confines the individual to his room, to his chair, to his bed, and of which the cause is not apparent. The physician ascertains that the pulse is quick, that the skin is dry, that there is fever, that the amount of urine is diminished, its specific gravity increased, and its color heightened, and he more or less suddenly comes upon the bronchitis in the course of his examination. The chest movements are feeble; respiration is more or less abdominal. The tape-line reveals not more than an inch difference, if that, between inspiration and expiration. There may have been made a diagnosis of general debility from old age. Percussion shows no dulness as a rule, though there may be strips of dulness along the spinal column—proof that the disease has associated unto itself a catarrhal or a hypostatic pneumonia.

Auscultation tells the story. A feeble, muffled, or absent vesicular râle, sibilant or sonorous ronchi, scanty tenacious expectoration tinged with blood, make the diagnosis. We look for the disease in childhood in connection with measles, small-pox, and typhoid fever. It is not infrequently a sequel of diphtheria. It belongs to tuberculosis in all parts of its course. It assumes gravity in childhood for the reason, as stated, that the tubes are finer, and the amount of swelling that would offer no appreciable occlusion in the adult lung produces stenosis in a child's lung. Then the tubes are shorter in a child's lung, so that diseased particles which would lodge somewhere along the surface of the big tubes of the adult penetrate to the recesses of the child's lung. Both childhood and old age are more liable to bronchitis from the fact that the power of expiration and expectoration is less marked. There is not the same resilience in the lung-substance itself, and there is not the same muscle-force outside the lung; so that in both these cases infections are liable to be introduced by aspiration from the mouth, from the throat, and from the upper into the lower bronchi. Mucus accumulated in the mouth and throat, mucus from the nose, epithelial débris, decomposing food, vomited matter, micro-organisms for which

the mouth is a reservoir,—all these materials may be aspirated into the recesses of the lungs to produce first a bronchial catarrh, later even a putrid bronchitis or gangrene of the lung itself.

Chronic bronchitis frequently occurs as a result of the acute form of the disease, especially as the result of repeated attacks of acute bronchial catarrh, but much more frequently as a result of other affections of the lungs. Thus, chronic bronchitis is a more or less constant companion of emphysema, tuberculosis, and chronic pleurisy, especially in its purulent form, empyema, and still more frequently it results from diseases of other organs which interfere with the circulation in the lungs. Thus, heart disease, kidney disease, and diseases of the liver are attended at some time or other in their course by bronchitis, subacute or chronic.

Chronic bronchitis distinguishes itself by its subacute character, not only as regards duration, but intensity of symptoms. Violent symptoms in its course betoken acute complications to which patients affected with chronic bronchitis are especially liable. The cough is not so frequent or severe, but continues over a longer time. Expectoration, on the other hand, may be much more abundant and different in many particulars. Dyspnœa is not, as a rule, so pronounced. It is a disease, however, which is by no means a trivial affection. It may be, and often is, followed by complications of gravity. Nearly all cases of long standing show some emphysema. The chief damage, however, is done to the heart as a result of long-continued cough and strain. There occurs hypertrophy of the right ventricle, which in time must result in degeneration, dilatation, and incompetency. There are presented then cyanosis, œdema, dyspnœa, syncope attendant upon heart failure, with, in more protracted cases, oliguria, with the consequences of stasis of the kidney, somnolence or insomnia, headaches, dropsies, and coma. So, while, as a rule, chronic bronchitis is not a disease of gravity *quoad vitam*, it has a more or less grave prognosis *quoad valetudinem*, and may in special cases, more especially cases debilitated by other disease, still more frequently in age, be attended through its consequences with fatal results. The fact is continually to be emphasized that chronic bronchitis is rarely a consequence of acute bronchitis. It is mostly a secondary malady due to affections of other organs.

Bronchitis is often divided into two forms according to the abundance of its secretion. Thus, there is a dry bronchitis, the *catarrhe sec* of Laennec. This form of inflammation attacks more especially the finer bronchial tubes, where the same amount of swelling produces marked occlusion, and is characterized therefore by dyspnœa which seems out of proportion to the physical signs. There is no expectoration; there is sharp dyspnœa, more pronounced cyanosis, anxiety, nervous unrest, and distress. This form of bronchitis is found frequently as a consequence, or in the course, of measles, whooping cough, and

tuberculosis; and, because developing gradually, is discovered more or less suddenly, especially in cases of apathetic, debilitated aged persons who have made no complaint that might call attention to the lungs.

On the other hand, there is a form of bronchitis which is attended by such profuse expectoration as to merit the name *bronchorrhœa*. The discharge consists of thin, watery, frothy matter which separates itself into layers. Pints or quarts of this fluid may be discharged in twenty-four hours. On rising from bed there is usually profuse expectoration of mucus that has accumulated over-night, more particularly in bronchiectatic cavities. The signs are not so distressing in this disease. There is no fever, there is little or no dyspnœa. The cough is not so harassing, because it is less continuous and more paroxysmal, and relief follows the expectoration of a quantity of fluid. Patients affected with bronchorrhœa may maintain a *bien-être* for years; the condition of health, however, in many cases becomes impaired daily, not infrequently because of associated, if not causative, tuberculosis. A particular alteration occurs in the sputum of some of these cases, constituting what is known as a *bronchitis putrida* or fœtid bronchitis. Putrid bronchitis seldom occurs as a primary malady or in people in perfect health. It shows itself in the course of ordinary bronchitis, usually in the course of bronchitis secondary to other diseases. The patient is more or less suddenly attacked by chilly sensations, followed by elevation of temperature, and then in the course of a day the discharge assumes a peculiar and offensive odor, a kind of a sweet, rotten odor, "that of the mayflower or apple-blossom," said Laycock, "with a kind of *arrière gout* of fæces." The matter separates itself distinctly into layers on standing, the upper layer, muco-purulent, frothy, with masses of more or less solid mucus from the coarser bronchi; the middle, a scanty greenish sero-albuminous fluid; and the lower, more or less distinctly purulent sediment, yellowish-green, the sediment consisting in large degree of smaller more solid caseous-looking masses, which Dittrich has shown to be expressions or casts of the finer bronchi, "Dittrich's plugs"—masses which crumble under pressure and evolve that unspeakably offensive odor which makes the patient an object of disgust to himself and every one else. One such patient will contaminate the air of a ward in a hospital, of a large room in a factory, or of a whole house. The odor may be recognized upon opening the front door. It is impossible to account for the sudden change which occurs in the sputum in these cases. It is easy to see that the sputum abounds with micro-organisms, fungi—Leyden speaks of a particular form of leptothrix—all the bacteria of decomposition, fat-products, and crystals; in fact, all the products of decomposition—sulphuretted hydrogen, ammonia, fatty acids, leucine, tyrosine—may be discovered in this sputum.

The disease is found in association at times with gangrene of the lungs, which makes itself manifest by the same offensive odor. But Traube has shown that the diseases are different; while they may coexist, they are more frequently independent.

This form of bronchitis does not cease suddenly as it began, but gradually if it cease at all. It is very obstinate to treatment. It shows itself in exacerbations and remissions for months, for years, sometimes for life. It might be supposed that this form of bronchitis resulted from the aspiration of products of decomposition from the mouth and throat into the lungs. Such an assertion may not be disproved, but it is a curious fact that individuals who work most with decomposing products, as tanners, scavengers, rag-pickers, show no predisposition to it. It is, fortunately, the rarest form of bronchitis.

A peculiar variety of bronchitis is offered in the so-called *fibrinous bronchitis*, or bronchial croup. This affection develops in consequence of tracheal croup or croupous pneumonia only as a very great exception. As a rule, the disease is secondary, and occurs in the course of other affections of the lungs, chiefly in consequence of ordinary bronchial catarrh. The cause of this peculiar transformation is entirely unknown. The individual will have been, as a rule, in the enjoyment of his usual health, or that degree of it which belongs to ordinary bronchitis, when he is seized suddenly with chills or chilly sensations, to be followed by fever and symptoms of great distress on the part of the organs of respiration. That is, there is more or less dyspnœa, great constriction, profound anxiety and feeling of impending suffocation, which indeed threatens and at times actually occurs. There is during the whole of the attack a most violent, harassing cough, which is attended in some of its explosive efforts with the discharge of casts of the bronchial tree. These casts alone establish the diagnosis. They may be recognized often with the naked eye as grayish-white masses of flesh-colored substances tinged with extravasated blood. They may be more readily distinguished, and are often only recognized at all, after immersion in water, when the branching of the bronchial cast is shown. They are thus distinctly casts of the bronchial tubes, and consist in the smaller tubes of solid masses of fibrin which have undergone hyaline transformation, enclosing a large number of white blood-corpuscles with a few red. The smaller casts are solid; the larger, hollow and composed of concentric layers.

The sudden development of the disease with acute manifestations after chill and fever has led to the belief that fibrinous bronchitis is an acute infection, and analogy would place it in the same category with diphtheritic croup and croupous pneumonia, of whose infectious character there is now no doubt.

The disease by no means always occurs in this acute form, though

much more frequently acute. The chronic form occurs also in the course of ordinary bronchitis, as a rule, but is distinguished by the milder character of the symptoms. It runs a course for the most part without fever, and is a malady consisting rather of exacerbations and remissions than of a continuous course. It is distinguished in its exacerbations by the same signs of distress as in the acute form, and is absolutely recognized only by the expectoration of casts of the bronchial tubes. Both forms occur especially in the young, between the ages of fifteen and thirty years, with exceptions, however, in the extremes of life. Kisch, for instance, reports the case of an individual aged sixty-six years who suffered from repeated attacks of fibrinous bronchitis, and who expectorated at times, over a period of twenty-five years, masses which looked like coral collections. Intervals of weeks or months, and sometimes even of years, with freedom from symptoms distinguish some of these cases of fibrinous bronchitis. Bugge, who collected the statistics of 90 cases with special reference to cause, found that the great majority followed in the course of chronic bronchitis and phthisis.

The acute form of the disease has a very grave prognosis, inasmuch as 25 to 50 per cent. succumb within fourteen days. The mortality in chronic fibrinous bronchitis ranges about 12 per cent. Chronic fibrinous bronchitis distinguishes itself not so much by the intensity of its symptoms and its mortality as by its complications. Emphysema, atelectasis, and catarrhal pneumonia ensue in a certain number of cases.

The character of the casts frequently locates the affection. Casts from the upper portion of the lungs subdivide more rapidly as the bronchial tubes of this part of the lung rapidly grow shorter. Ordinarily, bronchial casts are in their thickest portions about the size of goose-quills, and subdivide gradually to the size of threads. The cause of this peculiar transformation of the secretion of the bronchial tubes remains involved in obscurity, and, as Kisch declares, the treatment, like the etiology, is as yet unexplored territory.

The last variety of bronchitis is that pathological alteration in the walls of the bronchial tubes which permits their dilatation to constitute what is known as *bronchiectasis*. This condition was not known until the time of Laennec, for the reason, as he states, that dilatations of smaller tubes were considered as normal tubes of larger size, and great dilatations of larger tubes were looked upon as vomicæ or cavities of phthisis. A closer inspection of the dilated tubes readily distinguishes them from normal tubes by their size at the periphery, inasmuch as normal tubes grow smaller gradually ; tubes pathologically dilated terminate abruptly. Bronchiectasis occurs more frequently in the upper anterior portions of the bronchial tree, and concerns chiefly a few tubes

of the third and fourth order. Tubes of the first order are never affected in this way. The disease is never primary, but occurs always in connection with other maladies, chiefly with long-standing chronic bronchitis, catarrhal pneumonia, and, more especially, tuberculosis. Corrigan in 1838 furnished the most satisfactory explanation of the development of most cases in his description of the fibroid condensations that occur in the lung, which were subsequently called interstitial pneumonias, later fibroid phthisis, and which we now consider to be relics in all cases of tuberculosis. The contraction of this hyperplastic mass of connective tissue, as in the process of cicatrization elsewhere, mechanically drags upon the tubes to force the deformity; and this deformity is aided all the more by the fact that the bronchial wall itself suffers from lack of nutrition, interruption of its circulation, and consequent degeneration. The deformity occurs in various forms, the uniform enlargement with cylindrical dilatation, with fusiform or spindle-shaped dilatation, sacular dilatation, with such consecutive sacular dilatations as to constitute the beaded appearance, or with such separation of the dilated portions, with retention of their contents as to form cysts in the lung—a very rare condition.

The *diagnosis* of bronchiectasis is by no means always easy, for the clinical picture is that of the underlying condition of chronic bronchitis or tuberculosis. There are therefore all the signs which belong to chronic bronchitis—cough, expectoration, interference with circulation, and dyspnœa, more or less pronounced. Somewhat more characteristic is the paroxysmal character of the cough and the discharge at intervals of large quantities of pent-up fluid. These mouthful or more copious discharges, however, speak for bronchiectasis by no means positively, as abundant discharges, paroxysmal in character, are often seen in simple chronic bronchitis, and more especially in tuberculosis; not infrequently, as is known, the discharge from an abscess below the diaphragm, as from the liver, takes place in this way.

Physical signs are not especially marked. The chest expands, there is no percussion dulness except in the presence of a very large cavity. Auscultation reveals only the signs that belong to chronic bronchitis or tuberculosis. The differential diagnosis of bronchiectasis from chronic bronchitis rests more upon the discharge of large quantities of fluid, as a rule exceedingly offensive from decomposition, at intervals. These symptoms, which may occur as episodes in the course of bronchitis, belong to the regular course of bronchiectasis. Tuberculosis is distinguished by its more or less continuous fever, its progressive emaciation, hæmoptysis, night-sweats, etc., and more particularly by the discovery of elastic tissue and the tubercle bacillus. Bronchiectasis has no definite duration. A developed deformity cannot be cured.

The treatment is that of the underlying condition upon the state or stage of which the prognosis rests.

Treatment.

Acute bronchitis is best treated by rest in the house, preferably in bed, and the use of diaphoretics. Thus, an acute cold may be often cut short by 10 grains of Dover's powder at bed-time, or by a grain of opium in any other form. Diaphoresis is often pleasantly and profusely excited simply by warm drinks, especially if preceded or followed by a warm bath. Common green or black tea taken hot and in quantity is a diaphoretic as effective as any of the nauseating teas or infusions of the materia medica.

In the acute bronchitis of childhood the warm bath plays the most important rôle if given three or four times in the course of twenty-four hours. It is nearly always followed by peaceful sleep. Should diaphoresis fail, the treatment becomes purely symptomatic.

In relief of the cough appeal is made to the expectorants. Chief among the expectorants in our day ranks apomorphine. A good prescription for a child is—

℞.	Apomorphinæ hydrochlorat.,	gr. ss to gr. j ;
	Acid. hydrochloric. dilut.,	gtt. x ;
	Syrupi,	f℥ss ;
	Aquæ menthæ piperitæ,	f℥iss.—M.

Sig. A half to one tea-spoonful every two hours.

Apomorphine is a very soothing expectorant which acts like an anodyne, and, as has been proved by experiment, has real virtue as an expectorant. In bad cases of cyanosis and dyspnœa the remedy is best used subcutaneously in doses of $\frac{1}{12}$ grain, increasing the dose if necessary.

Ipecac in wine or syrup is a time-honored remedy, and, especially in the form of the compound mixture, has a wide range of use. 1 grain of tartar emetic dissolved in a glass of cold water, of which a tea-spoonful may be taken every hour, is an old and useful remedy. When the cough becomes more severe, and especially if it be associated with much pain, the necessity arises for the use of morphine, which may be incorporated with the apomorphine in the prescription above cited. Or the opium may be given in tincture, simple or camphorated ; under no circumstances, however, should morphine be given to children. For an adult a prescription might read—

℞.	Morphinæ sulphatis,	gr. j ;
	Aquæ lauro-cerasi,	f℥ij ;
	Aquæ,	q. s. ad f℥ij.—M.

Sig. A tea-spoonful every two, three, or four hours.

The same relief, without risk, may be reached in children by the substitution of belladonna, which may given in the form of tincture in a dose of 1 drop for every year of the child's age. A few dry cups applied to the surface of the chest give great relief from pain at any age. Wet cups succeed when dry cups fail. Flying sinapisms often suffice. Where pain is very severe, in exceptional cases, especially in childhood, a poultice may be put about the chest.

For fever there is no remedy so good as quinine, which supports the heart while it attacks the fever. Many individuals learn to cut short a cold by a single dose of 10 grains of quinine fortified with a drink of hot whiskey, and whiskey or brandy is always a safe remedy to give to a child, with a smaller dose of quinine—not over 5 grains. Relief from fever is also given by the other antipyretics, such as antipyrine, which may be given to an adult in the dose of from 3 to 5 grains, to a child 1 to 2 grains; antifebrin in the same dose, or phenacetin in double the quantity. Phenacetin is the safest remedy. None of these drugs act so well in childhood as the warm bath, and where bronchitis has become capillary and dyspnœa assumes prominence or actual cyanosis has occurred, no remedy ranks in value with the hot or warm bath and cold affusions to the head and chest while in the bath. Juergensen has shown that a small stream of cold water directed to the nape of the neck will cause deep inhalations. A debilitated child will require additional stimulation in the form of senega, carbonate of ammonium, caffeine, or digitalis. One drop of the tincture of digitalis every hour or two is at times invaluable.

The treatment of chronic bronchitis varies more with the intensity than with the character or form of the disease. It is usually made a very long chapter, but the remedies which are of real value are few. Prophylaxis is the subject which merits discussion first. As has been remarked already, bronchitis is the most frequent of all diseases, and the greatest contingent of cases occurs in childhood. When we regard the manner in which children are reared in closed apartments, with defective ventilation, too warmly clad, for the most part not regularly bathed, in the ill-heated, ill-ventilated habitations that constitute what is known as the house-climate, it cannot be wondered at that bronchitis, a disease which results from the inhalation of a contaminated atmosphere, is so frequent. We have also to regard here, as well as in the case of adults, the frequency of tuberculosis, which has bronchitis as its forerunner for months and as its companion for life. Rickets too is a disease which belongs to childhood, and which has bronchitis as one of its prominent and more or less constant symptoms. These three causes—vitiated house-air, tuberculosis, and rickets—account for the large majority of cases of bronchitis. In children bronchitis belongs, therefore, to those who

are debilitated or diseased, and the factor of supreme importance in childhood is prophylaxis.

It is needless to say at this age that a house can be well ventilated, that sunlight and fresh air may be freely admitted, that the temperature may be regulated, that the house may be kept dry. It goes also without the saying that children affected with tuberculosis, rickets, and syphilis must be treated for these diseases. Phosphorus, iodine, creasote, cod-liver oil, iron, quinine,—these agents belong as much to prophylaxis as to treatment. Then comes the cold bath. Weak and debilitated children and adults are best inured by baths which should be warm at first, then tepid, cool, and even cold, with brisk friction to the skin until the surface is brought to a glow, the perfection of the reaction being the indication of the grade of temperature for the next bath. Fresh air, exercise, a shorter stay in school, a better ventilated school-room,—here is a subject which requires a chapter of itself. The regulation of clothing, the avoidance especially of heavy underwear, of mufflers and comforters about the throat, the exposure of the body until it becomes hardened like the face,—these are means which must be adopted gradually, that the body may become finally inured and, as it were, insured against bronchitis. A subject which deserves continued emphasis is the destruction of the sputum, which so often conceals the most dangerous parasites. Old men are best protected by avoiding vicissitudes of temperature, especially as connected with moist or windy days. On cold wet days the old man should remain at home in his room—in the chimney-corner if not in bed. The circulation of the old man is to be sustained by another meal if necessary, later in the night—by wine, brandy, or an extra cup of coffee or tea. Senile bronchitis may be avoided also by change of climate. Individuals whose circumstances will permit should seek the warm moist climates of Florida, Southern California, the Bermudas, Nassau, or the dry warm climate of Central Florida, Georgia, Aiken, Asheville, and the Carolinas.

Chronic bronchitis requires more continuous treatment. In the dry form of chronic bronchial catarrh exudation may be furthered or forced by inhalations. The agent of most value in these inhalations is steam, and it is best generated by a steam-atomizer. Simple atomizers without heat are of no value. The steam is given some additional solvent powers by the use of common salt, more particularly the bicarbonate of sodium in saturated solution, or disinfectant properties with carbolic acid, thymol, or boric acid. In capillary bronchitis steam is a necessity. Where the discharge is excessive in bronchorrhœa the best remedy is turpentine, which should be given in the form of capsules, containing from 5 to 10 drops. Capsules of turpentine are swallowed without taste with milk, or 5 to 10 drops of turpentine may be dropped into

a wine-glass of milk. Finally, turpentine may be smoked for a long time in a pipe. Here, however, there may be evidences of idiosyncrasy, such as slight cerebral disturbance and vertigo. A good substitute in these cases or in any case is terpin hydrate, which may also be given in capsules, 5 to 10 drops, or in pill, 1 or 2 grains, three or four times a day. The balsams of Peru, tolu, copaiba, and sandalwood have virtue in individual cases. Cod-liver oil is food as well as medicine. Many cases yield only to the prolonged use of iodine, which is best given, in the form of the iodide of potassium or sodium in peppermint-water, in the ounce-to-ounce solution, beginning with from 10 to 20 drops three times daily, largely diluted with milk. Its action is best suited to the cases complicated with asthma or dyspnœa. The best prescriptions for chronic bronchitis owe their virtue chiefly to the iodine they contain.

Putrid bronchitis requires antiseptics, which may be inhaled from the atomizer, as suggested above. Terpin hydrate is here also of value internally. A most excellent remedy recently recommended is myrtol, which should be taken internally in doses of 5 or 6 grains. Myrtol acts through the blood; it may also be inhaled. It lessens the excessive quantities of sputum in putrid bronchitis and bronchiectasis, diminishes the offensive odor or destroys it altogether, and often in the course of a few days puts a new phase upon a disease which has hitherto assumed alarming gravity.

Bronchiectasis has no special therapy. No drug can restore tone to or contract the dilated bronchial walls. The treatment is the same as that for chronic bronchitis, and more especially for putrid bronchitis, whereby disinfectant inhalations, more especially of terpin hydrate, menthol, and myrtol, play important parts. As has been intimated, the diagnosis of bronchiectasis or its differentiation from cavities in the lung from tuberculosis is by no means easy. Moreover, inasmuch as these cavities are scattered throughout the lungs, there is none of that hope from surgical intervention which might be entertained were the affection local.

In all cases of chronic bronchitis, especially where chronic organic changes have occurred in the bronchial walls, such as excessive hypertrophies, atrophies, decompositions of their contents, and ectasias, there is necessity for support with alcohol. Senega and serpentaria are considered good substitutes for squill, ipecac, and antimony in the debility of age. The carbonate of ammonium, best given in milk, is a remedy of value in advanced life or in extremis. The Germans have an anisated solution of ammonia which is a good preparation. Apomorphine is safe, quick, and pleasant. A remedy which is of signal virtue in the chronic bronchitis of the aged, in the capillary bronchitis which may not be separated from catarrhal pneumonia at either

end of life, more especially in the chronic bronchitis of old age associated with heart failure and kidney suppression, is nitro-glycerin, of which 1 or 2 drops of a 1 per cent. solution may be given every hour or two, or, to bridge over a sudden collapse, subcutaneously in doses of 1 to 5 drops.

To sum up the therapy of bronchitis, the best remedy in the treatment of the bronchitis of childhood is hydrotherapy; the best remedy in the treatment of the acute bronchitis of maturity is diaphoresis; for chronic bronchitis the discovery and treatment of its cause, whether tuberculosis, emphysema, heart disease, or disease of the kidney; the best remedy for senile bronchitis is support and change of climate.

WHOOPING COUGH.

General Considerations.

Whooping cough is an acute infection characterized by a series of breath-taking coughs, apparently threatening asphyxia, followed by a long-drawn, audible (whoop) inspiration.

The disease, considered first as a gastric condition, next as a catarrhal affection, then as a neurosis, has finally taken its definite place among the acute infections. Gerhardt goes so far as to remove it altogether from the category of lung diseases and give it a place between meningitis and cholera. Strümpell discusses it along with maladies of the bronchi. Fleischner more properly puts it between croup and mumps. Whooping cough is certainly an infectious disease, because it is contagious and prevails as an endemic and epidemic: because also of the absolute immunity which one attack confers. Rare as are second attacks of scarlet fever, measles, or small-pox, still more rare are second attacks of whooping cough. With the other infections it attacks preferably the age of childhood. Facts which have been taken to militate against the views of its infectious nature are the absence of fever and indefiniteness of duration.

Whooping cough consists in essence of a slight catarrh of the upper respiratory tract, especially of the larynx, and a heightened reflex of the vagus. As stated, the disease is contagious, and it is rare that one child only in a house is affected, yet there are differences in susceptibility. The disease occurs by preference between the ages of six months and six years. Girls, because of greater confinement to the house, are more frequently affected. Sucklings, because of protection, are rarely attacked, yet cases are on record where the disease has occurred in infancy and in advanced life. Susceptibility diminishes at six and is nearly annulled at ten years. In the exceptional cases in which the disease

occurs in advanced life it runs a mild or abortive course. Measles, pregnancy, and the puerperium predispose to pertussis. The contagion is conveyed directly.

The contagious principle exists probably in the sputum, hardly possibly in expired air, which contains no sputum. It is therefore a *contagium habituosum*. The great botanist Linnæus nearly two centuries ago expressed the belief that whooping cough was due to a *contagium animatum*, which he thought would be found to be the eggs of insects. The principle is thoroughly accepted in our day. The cause is believed to be a micro-organism, which, notwithstanding the claims of Hallier, Letzerich, and Bürger, remains still undiscovered and unknown. The contagious principle is not often disseminated without direct exposure to the disease. Thus very slight isolation secures exemption from the attack. The poison has no great tenacity of life. Cases in which the disease has been conveyed after weeks or months by clothing, curtains, or other fomites so common in measles, and more especially in scarlet fever, are very rare in whooping cough. The disease is spread by direct contact in families, and more particularly in kindergartens and schools, to assume endemic proportions, and cease only when the material is exhausted.

Whooping cough occurs with especial frequency, as stated, during convalescence from measles. The disease shows itself also in close relation to tuberculosis. It has long been noticed that tuberculosis often follows close upon the heels of whooping cough. It is impossible to say in a given case whether the whooping cough made the soil fertile or merely aroused the latent disease.

The name is derived from the fact that the cough is distinguished by a prolonged, forcible, and audible inspiration through a spasmodically contracted glottis. But many cases of whooping cough exist without this characteristic sound, and where different stages of the affection may be recognized the sound is absent during the whole of the first stage. The cough consists of a series of short, sharp explosions, spasmodic in their character; a series of expiratory efforts without interruption, until, finally, after the lapse of from fifteen to sixty seconds, at the point of exhaustion, occurs this prolonged audible inspiration. It is a series of explosive coughs in quick and uninterrupted sequence—the short sudden cough, the staccato cough, which marks a case of whooping cough.

In its ordinary course the disease may be divided into three stages: first, the catarrhal stage, which often commences as an acute infection of the mucosæ, coryza, photophobia, pharyngitis, rhinitis, and fever, but differs in no other way from ordinary tracheal or bronchial catarrh, and is recognized as whooping cough in some cases only by the fact that the disease exists in more marked form in the family, and that the

catarrhal attack suffices for future exemption. It may be added also that there is in this stage less hyperæmia and swelling of the larynx and trachea than can be recognized, as a rule, in bronchial catarrh. This common cold, so called, may last several weeks before the second stage—namely, the convulsive stage—occurs.

The neurotic element now assumes prominence; the cough becomes more continuous, severe, harassing. The intervals between the paroxysms are more distinct. Very soon the cough assumes the convulsive character mentioned, and sooner or later occurs this typical staccato cough with the long-drawn, audible inspiration. The case is now easily recognized.

In these attacks the seizure is very sudden. There is at most a sense of intense, irritative tickling in the larynx, which leads the child from its former experience to leave its play and run to its parents or grasp a chair for support. In the expiratory effort the breath is lost, the face becomes dusky and cyanotic, the eyes protrude, the vessels throb in the neck; hæmorrhages may occur from the nose, from the mouth. There are subconjunctival hæmorrhages which do not disappear with the subsidence of the cough. The membrana tympani rupture at times and free blood appears at the external meatus. Ectatic vessels burst in the skin of the face, in the cheeks, to show—visible at a distance—subcutaneous extravasated blood. Hæmorrhage from the stomach or intestine or from the kidneys or bladder is much more rare. Hæmorrhage into the brain, which does sometimes occur, is very much more rare. The stomach is subjected to so much compression as to lead to vomiting, and the discharges from the bladder or bowels, especially in young or debilitated children, may occur involuntarily.

The view that whooping cough depended upon catarrh of the larynx and bronchi found support in the investigations of Marcus, Loeschner, and Oppolzer. Herff more especially had the almost incredible fortitude to study the condition in himself. Watching his opportunities to investigate the larynx even during an attack, he found marked hyperæmia of the inter-arytenoid folds, the under surface of the epiglottis, with mucous deposits especially on the posterior laryngeal wall. He maintained that removal of these deposits jugulated the attack. Rehn in his studies found the posterior wall of the larynx perfectly sound, the anterior wall showing the most change; while Rossbach found all parts of the larynx and trachea without any pathological alteration. So that whooping cough has really no morbid anatomy except in its complications.

It is a very erroneous idea to consider whooping cough as a trivial malady. There occurred in England in the year 1877, of 500,341 deaths, 10,318 deaths from whooping cough. In New York in the decade from 1866 to 1877, where 4062 deaths occurred from typhoid

fever, there were 4094 deaths from whooping cough. Hagenbach says that whooping cough had more victims in Basle in the fifty years from 1822 to 1872 than any disease except typhoid fever and diphtheria. The general mortality is estimated at 3 to 5 per cent. It has reached as high as 48 per cent. in the second year of life.

The recognition of whooping cough in the convulsive stage is an easy matter. The series of rapid, sudden, explosive, breath-taking coughs, attended by the evidence of venous stasis, cyanosis—whence the old name, blue cough—which ceases only when a quantity of mucus, under the combined efforts of cough, retching, and vomiting, is expelled; the prolonged expiratory efforts, followed by a long-drawn, audible inspiration, which has been not inaptly likened to the bray of an ass; and the gradual cessation of the disease, sufficiently characterize it.

In the first stage whooping cough is not so easily separated from other forms of catarrhal affections. The age of the patient throws some light upon it. The presence or absence of disease in the history, more especially the existence of other cases in the family or community; then the obstinacy of the cough, the longer duration, the fewer physical signs to account for it; the more spasmodic character of it, with intervals of more complete exemption,—excite suspicion or confirm the evidence of the disease.

In the last stage there will have been generally a well-marked history of previous whoop in the cough, which may, indeed, be still occasionally heard. Here too there is a more marked interval between individual attacks than is common in the ordinary bronchitis; a slight nervous element still prevails. The cough will have lasted unusually long, six to twelve weeks; other cases in other stages of the disease are in the vicinity, etc.

The prognosis depends, aside from the condition of the patient himself, upon the severity and frequency of the attacks. A single explosion may last from fifteen seconds to an entire minute, and a series of explosions which constitute an individual attack may last from ten to fifteen minutes. The prognosis is grave where the attacks reach fifty in the course of twenty-four hours; at sixty it assumes special gravity. Individual attacks may do damage also by their intensity; thus hæmorrhage may be copious from mucous surfaces. Blindness occasionally results, probably from œdema of the brain. It is almost always temporary, and disappears with the subsidence of the œdema. Then, subarachnoid hæmorrhage, unusual as it is, is sometimes fatal. Such excessive vomiting occurs in certain cases as may not be stilled with the cessation of the attack, so that inanition may result. Psychopathies from the profound mental disturbance, fortunately usually temporary, are occasionally reported. Absolute exophthalmos has been produced

by excessive retro-bulbar hæmorrhage. Rupture of the membrana tympani, with subsequent otitis media, has resulted in deafness and, occurring in very early life, in deaf-mutism.

The disease has also sequelæ which make it dangerous. Bronchitis is frequently associated with it, whereupon may develop bronchiolitis, capillary bronchitis, and catarrhal pneumonia, which have their own special gravity. Emphysema is more rarely observed, and in consequence of it still more rarely pneumothorax. The frequency with which the disease is attended with, preceded by, or followed by tuberculosis has been remarked already. Thus it will be seen that whooping cough is by no means a trivial disease.

Prophylaxis.

As the disease has, at least at times, such gravity, prophylaxis assumes importance. The only prophylaxis worthy of the name is isolation. Isolation to be effective must be complete. The patient must be separated not only from children, but from adults who come in contact with unaffected members of the family. As this isolation in a disease which is usually considered so mild is practically impossible, attention should be directed rather to the protection of delicate members of the family; they should be isolated rather than the patient. It is advisable that tuberculous, rachitic, or otherwise diseased or debilitated children should be removed from the house as early as possible. Whooping cough is contagious in all stages of the disease. So long as there is cough, matter is expectorated, to be dried and disseminated, and thus to propagate the disease. In the removal of children from the house warning should be entered at the new place of residence, that the disease may not be developed in new centres.

The most essential element in prophylaxis at all times is the destruction of the sputum. Though the individual is attacked with the suddenness of an explosion, mucus, at least in quantities, is not expelled until the attack has spent itself, so that there is, for the most part, time for the collection of sputum in water. As in tuberculosis, the handkerchief should never be used for the reception of sputum. Perfect prophylaxis implies also the use of separate beds, the separate washing of bed-linen or the subjection of it to steam or dry heat, the use of separate utensils for food, the use of separate clothing, etc.

Treatment.

Until the specific nature of the disease shall have been determined there can be no question of any specific treatment, and remedies can be addressed only to its symptoms. The symptom which assumes prominence, and upon which nearly all the complications of the dis-

ease depend, is the cough, and the nature of the remedy which is used against the cough will depend upon the view which the practitioner may take of the nature of the disease; that is, whether it be catarrhal, neurotic, or mycotic. The truth is, the treatment of whooping cough remains still in the stage of empiricism; and as nearly every remedy in the materia medica has been tried to relieve the cough, so appeal is made to every new remedy as fast as discovered. Young practitioners find specifics in every new remedy.

The older writers used the anodynes early. Opium in some form or other was the shield which was early interposed. In more modern times the active principle of opium, morphine, was and still is extensively employed. The following is a good prescription:

℞. Morphinæ sulphatis, gr. ss–j;
Aquæ amygdalæ amar., f℥ss;
Aquæ, f℥iss.—M.
Sig. A tea-spoonful every two to six hours.

With the morphine was often combined 5- to 10-grain doses of the bromide of sodium or potassium, or there may be added to the prescription the hydrochlorate of apomorphine, $\frac{1}{2}$ grain to $1\frac{1}{2}$ grains, or for the bitter-almond water or cherry-laurel water may be substituted $\frac{1}{2}$ an ounce of either glycerin or syrup, simple or of orange-peel, raspberry, etc. The remedies commonly employed in the treatment of bronchitis are also frequently resorted to. The syrup, simple or compound, of ipecac, $\frac{1}{2}$ to 1 tea-spoonful; the wine of ipecac in half these doses; minute doses of antimony, $\frac{1}{64}$ to $\frac{1}{32}$ of a grain; belladonna, 1 drop of the tincture for each year of life; or atropine, 1 grain to 1 ounce of water, given in doses of from 1 to 2 drops two or three times a day. The iodide of potassium is a remedy of value. It may be given as follows:

℞. Potassii iodid.,
Aquæ menth. piperit., āā. f℥ss.—M.
Sig. Two to five drops in a dessert-spoonful of milk three or four times a day.

The iodides are more used in cases in which the chest is full of râles; the ipecac preparations especially in the presence of burning irritation in the throat and chest; belladonna, the bromides, and morphine being addressed more especially to the spasmodic element.

Camphor, valerian, asafœtida, and musk have their advocates in the treatment of whooping cough. Chloral had at one time high laudation in doses of 3 to 10 grains. Chloroform, ether, the bromide and iodide of ethyl, and amyl nitrite—2 to 5 drops—were inhaled with the hope of

curtailing the attack; creasote, the salicylates, and carbolic acid, were remedies administered internally and by inhalation for the destruction of the undemonstrable mycosis. Various antipyretics, more especially antipyrine, in doses of from 2 to 5 grains every two to four hours, do certainly prolong the intervals and mitigate the severity of the attack. These remedies were recommended indeed as specifics a few years ago in the treatment of whooping cough. Saturation with the bromides, gr. x–xv, four times a day, is the treatment now most in use.

The mere mention of the names of remedies recommended from time to time in the treatment of whooping cough would consume the space allotted to the discussion of the whole subject. One remedy, however, deserves mention, if only because it is the last used. This is bromoform, which was recommended first by Stepp of Nüremburg. Löwenthal used it in Senator's polyclinic in 100 cases, claiming that it made the attacks milder in the course of a few days. Bromoform is given in drop doses, 2 to 5, three or four times a day. Children one year of age receive three times daily 2 to 4 drops; children from two to four years of age receive 3 to 4 drops three to four times daily; children from four to eight should receive three or four times daily 4 to 5 drops, according to the number and frequency of the attacks. The remedy must be protected from the light, hence in dark bottles with good stoppers. It is usually given dropped in water, when care must be taken that the pearly drops floating about in the water are swallowed. If the use of the drug is stopped too soon, relapses occur. No bad effects have ever been observed from these doses. One child which received a larger dose than had been prescribed fell into narcosis, but was readily revived. Fischer of New York reports 51 cases, claiming almost specific properties. The duration of the treatment was from ten to thirty days, and cure occurred in 75 per cent. of the cases in from two to three weeks if there were no complications. Neumann of Berlin is more temperate in his statements. He tried the remedy in 25 cases, and believed that it exerted a favorable influence upon the individual attacks, but had no real effect upon the course or duration of the disease. He was never able to cut an attack short even by early administration of the drug, though he never saw any ill effects. These conclusions represent the results which are generally admitted, so that it may be said that bromoform is the most valuable of the late contributions to the therapy of this disease.

Among the latest remedies recommended the following may be cited: Carbolic acid in aqueous solution, 1 : 120, of which ½ an ounce three or four times a day is advocated by Oltramare; hyoscine hydriodate by Edelfsen; turpentine, revived by Ringk; pilocarpine, to abort the disease, by Albrecht; chloride of gold and sodium, by Magruder; cocaine, by Krimke; peroxide of hydrogen, by Richardson; cyanide

of mercury, by Drzewiecki; resorcin, by Concetti; oubaïn, by Gemmel; thyme, by Johnson.

Among remedies to be inhaled: turpentine, thymol, illuminating gas (carburetted hydrogen), carbolic acid, cocaine, sulphuretted hydrogen, tar, benzole.

Ledolier recommends chloral by rectal injection; Goldsmith sprays the nose with mercuric chloride or salicylates, and Rossbach applies the constant current of electricity.

PULMONARY EMPHYSEMA, ATELECTASIS, ABSCESS, AND GANGRENE.

By M. HOWARD FUSSELL, M. D.

EMPHYSEMA OF THE LUNGS.

As this paper will have to do solely with the treatment of emphysema, it will deal only with the vesicular form of the disease, and refer the reader to the various textbooks and monographs on the disease where the pathologically interesting form of interlobular emphysema will be found described. To Laennec is due the honor of the first accurate description of the pathology of this interesting condition, and, although his theory of its causation is not now generally accepted by pathologists as correct, he first placed the disease in such a light that its treatment was undertaken on a rational basis.

For purposes of treatment emphysematous patients may be divided into two classes: First, those with slight or moderate dilatation of the air-vesicles of the lungs; second, those in whom the process is far advanced, with great dilatation and some destruction of the air-vesicles and secondary changes taking place in other organs. Those belonging to the first class can be cured, or at least made very comfortable. Those belonging to the second class can be relieved of their urgent symptoms, and an almost unbearable condition rendered much less trying. Life may be prolonged, and in emergencies can be saved, but the condition of the lung and the secondary changes in the other organs can be but little affected by treatment.

Treatment must be directed to three distinct ends:

First, treatment of the general condition of the patient.

Second, treatment of the lesion.

Third, treatment of the complications.

Treatment of the General Condition of the Patient.—Accepting the view of Waters and his followers that the primary lesion of emphysema is a degeneration of the walls of the air-cells, treatment of the general condition of the patient becomes of paramount importance. Whether one agrees fully with this view or not, certainly a degeneration of the vesicle-wall does take place, and a treatment of tonic character directed to the building up of the whole system often

gives permanent relief from the distressing symptoms, and always is of benefit.

DIET.—In all cases the diet should be nourishing and digestible. Given a case in the beginning stage of emphysema, as indicated by a dyspnœa more or less constant, but distinctly worse on exertion, slightly prolonged expiratory sounds being the only physical sign, great care should be taken to avoid any food that will cause gastric disturbance, and especially attacks of flatulence. When the stomach and intestines are distended with flatus they prevent the easy descent of the diaphragm, and may increase a slight tendency to dyspnœa until one of the dreaded and harmful asthmatic attacks may be precipitated, which will add a certain amount of permanent distension to the already weakened air-vesicles. For extended remarks upon diet the writer refers to the article of Dr. Yeo in Volume I. of this System, but he cannot refrain from a few remarks upon the subject. He thoroughly believes that each patient is a rule unto himself, and must be studied alone, due regard being paid in all cases to the avoidance of fried foods, fast eating, and over-eating, the latter two evils probably being responsible for more attacks of indigestion than the materials taken into the stomach. A patient with a beginning emphysema should eat largely of meat, broiled or roasted, milk and eggs, with a view to giving tone to the system, that is beginning to show its weakness in the dilated air-cells. If the patient is more advanced in the disease, as shown by the more or less constant dyspnœa, with asthmatic attacks on the least indiscretion, the same diet, with an excess of milk over the solids, will be the proper one to follow. When great congestion of the liver, kidneys, and lungs, due to the failing heart, has taken place, then an absolute milk diet, which is at once the most nourishing and digestible, is best suited to the case.

EXERCISE.—In all cases not so far advanced that the mere act of walking will produce distressing dyspnœa, exercise should be taken. Great care should be used, however, that the golden rule, *Always stop short of the first sign of exhaustion*, is rigidly observed. In this, as in the dietary, no hard-and-fast rule can be laid down: what is just sufficient exercise in one case may bring on in another a paroxysm of dyspnœa, the effects of which will be felt for weeks. Increasing inability to breathe comfortably should be the first danger-signal, and whatever the form of exercise taken, it should be desisted from immediately upon the appearance of this distress. The form of exercise should always be mild. Severe strains on the heart, such as fast running, should be avoided. Under this paragraph I would urge the reader to caution his patient who is recovering from one of the complications of this disease, who finds himself for the first time out of doors, to observe the rule first spoken of. Such patients, I think, are

especially liable to take over-exercise, and will do themselves permanent injury by going beyond the mark.

Medication.—Iron perhaps is the first drug to be mentioned; certainly it has a wider range of usefulness than any other one drug. Most cases will be benefited by it. All cases need it where the blanched mucous membrane of the lips and of the eyelids indicate an anæmic condition. Patients whose percentage of hæmoglobin is low may have the conjunctiva quite red, while the labial mucous membrane is blanched; hence the lips rather than the eyelids should be examined. Iron may be given in the form of the tincture of the chloride, 15 to 30 drops, well diluted, after meals. A convenient formula when for any reason it is not desirable to prescribe the medicine in drops is the following:

℞. Tincturæ ferri chloridi, fʒiij;
Glycerini, fʒj;
Aquæ, q. s. fʒiij.—M.
Sig. Two tea-spoonfuls in water after meals.

The deleterious action of iron in this form upon the teeth may be avoided first by dilution, and second by rinsing the mouth thoroughly after taking the medicine. If the whole dose is tossed into the back of the throat and quickly swallowed, much less of the liquid comes in contact with the teeth than by using a glass tube through which the liquid is sucked. Indeed, this method, so frequently prescribed, has always appeared to the author to cause the very thing it aimed to prevent.

Basham's mixture is a convenient and pleasant way of administering the tincture of the chloride. It has the advantage of a decided diuretic power, and hence may be prescribed, especially where iron is indicated and there is any congestion of the kidneys. The familiar Blaud's pill, which is the dried sulphate of iron in combination with the carbonate of potassium, is a very agreeable preparation, and at the same time efficient. The formula, as given by Osler in Pepper's *System of Medicine*, is:

℞. Ferri sulph. exsiccat.,
Potass. carbonat. et tartrat., āā. ʒss;
Tragacanth., q. s.—M.
Fiat in pil. No. xcvi.
Sig. Two or three pills to be taken after each meal.

Flint's pill is an excellent form in which to administer small doses of iron. Each pill contains about half a grain of iron, combined with

all the inorganic salts in the proportion in which they are found in the blood, except chloride of sodium, which is in excess. It is known in the stores as the Saline and Chalybeate Tonic Pill of Flint, and one or two pills may be administered after each meal.

Some writers decry the use of strychnine in emphysema, on the ground that the seat of the lesion (the walls of the air-cells) contain no muscular tissue, and hence cannot be benefited by strychnine. This, theoretically, is correct, but when it is remembered that strychnine is one of the best general tonics we possess, it will be seen that to omit its use is to do away with one of our main stays in the treatment of all stages of emphysema, especially where the heart is beginning to fail. It may be given in pill form, beginning with a dose of $\frac{1}{20}$ grain three times a day, increasing this amount until some physiological action is observed. When strychnine alone is desired, a most convenient method of administration is to give a good tincture of nux vomica, beginning with 15 drops three times a day, and increasing the dose by one or two drops daily until 30 or 40 drops are taken three times a day, or until the physiological action of the drug is noticed.

Arsenic is perhaps second to iron in usefulness. It may be given as a general tonic, and is especially useful where the heart needs toning up. It may be given alone, in the form of Fowler's solution, in the dose of from 3 to 5 drops, well diluted, after meals, or in combination with iron and strychnine. A favorite pill, frequently used, is the following:

℞. Acidi arseniosi,
Strychninæ sulphatis, *āā.* gr. j;
Ferri redacti,
Ext. quassiæ, *āā.* gr. xxiv.—M.
Fiat in pil. No. xxiv.
Sig. One after each meal.

The proportions of strychnine and arsenic may be increased as the patient becomes accustomed to the dose. Practically, however, I have found that the above dose of arsenious acid is about as much as can be conveniently used for a prolonged period of time.

Cod-liver oil is an excellent tonic and a digestible food, and is frequently used in cases of emphysema where there is a moderate amount of disease and where the stomach will bear the drug. It is best to begin with tea-spoonful doses three times a day, and increase the dose as the stomach becomes accustomed to it.

Treatment of the Pathological Lesion.—The first condition found in emphysema has been described as a mere dilatation of the air-vesicles, such as takes place in the healthy individual in ordinary inspi-

ration. It may be said to be a chronic inspiratory state. Gradually the elasticity of the walls of the vesicles disappears, the walls thin out, and in many instances become entirely destroyed. In the early stages, before gross destructive changes take place in the walls of the air-cells, properly-directed treatment may permanently relieve this over-distension, and in all cases not beyond the hope of any relief may give marked comfort to the sufferer.

For a long time treatment of various pulmonary diseases by means of pneumatic cabinets has been practised. These cabinets were expensive, entirely beyond the means of the ordinary practitioner, and hence out of the reach of the mass of patients needing treatment. In 1871, Hanke suggested an apparatus by which either compressed air could be inspired or the patient could expire into rarefied air. This apparatus was improved by Waldenburg in 1873. This latter apparatus or a modification of it is the principal one now in use for the pneumatic treatment of lung affections, of which affections emphysema is perhaps the most favorably affected by such treatment. A brief description will not be out of place. The apparatus consists of an outer and inner zinc cylinder with attachments to be described. One end of each cylinder is closed, and the inner is inverted in the outer, with the closed end uppermost, after the manner of the ordinary gasometer. The closed end of the inner cylinder has two holes, one connected with a manometer and the other with a rubber tube fitted with a mouth-piece, the latter being provided with a valve by means of which the patient can expire or inspire, either into the atmospheric air or into the cylinder. Three uprights are fastened to the outer cylinder, over which run ropes through pulleys, these ropes having a weight at one extremity, and being fastened at the other to the inner cylinder. The outer cylinder is filled to a certain mark with water. The valve in the mouth-piece of the inner cylinder is opened, the weights removed from the ropes, and the cylinder allowed to sink in the water; the valve in the mouth-piece is closed, the weights attached to the ropes, and the cylinder rises, necessarily rarefying the air contained in the cylinder above the water, the amount of rarefaction of course depending upon the amount of weight attached to the ropes. If the communication between the cylinder and the outer air be now opened for an instant, the cylinder will rise, and the amount of rarefaction of the air will remain the same. If it is desired to use compressed air, the valve of the inner cylinder is opened and the cylinder drawn to the top; the valve is now closed, the weights removed from the ropes and placed on the top of the cylinder, the cylinder is depressed, and the air compressed.

The apparatus is used in the following way: The mask of the mouth-piece is pressed by the patient closely over the mouth and nose

with the left hand; the right hand is used to control the valve, so that he may expire into or inspire from the apparatus as desired. He breathes deeply in and out, keeping the mouth open while breathing. On an average a patient will exhaust the apparatus in from ten to twenty respiratory movements. He is allowed to use the apparatus two or three times at one sitting.

Patients allowed to breathe into rarefied air obtain most marked relief from the symptoms of dyspnœa which to them is the bad feature of their disease. The writer has been told by emphysematous patients that one sitting of expiration into rarefied air has given them more marked relief than any other form of treatment they have had. It not only relieves the symptoms, but it does so by allowing the over-distended air-cells to part with a more than usual quantity of air, and thus relieves not only the symptoms, but the cause which has become the factor which continues to destroy the elasticity of the air-cells. The pressure in the cylinder being less than that of the atmosphere with which the chest is surrounded, necessarily a greater quantity of air is driven out of the air-cells. If the lesion is not so gross that anything which relieves simply does so by mitigating the severity of the symptoms, and if the vesicles are not beyond all hope of restoration, this treatment offers the best means at our command for permanent relief, and even in bad cases helps to prevent further progress of the distension of the vesicles.

Though expiration into rarefied air is the usual method employed, it is known that *inspiration* of *compressed* air excites the circulation in the air-vesicles, and tones them up by the more rapid passage of blood through their capillaries. On this account it has been suggested, and by some who claim excellent results, that the patient should alternately inspire compressed air and expire into rarefied air. At this point the writer would refer to the admirable résumé of this subject in Dr. Cohen's article on "Tuberculosis" in Vol. I. of this SYSTEM.

For a long time manual compression of the chest during expiration has been practised as a most efficient means in aiding the labored expiration. If this method is practised systematically, it is claimed that permanent improvement can be gained. The chest is grasped by the patient's own hands, with the thumbs toward the spine and the fingers spread out over the anterior wall, strong compression being made during each expiratory act. The compression can of course be made by a second person, thus taking off a certain amount of physical exertion from the patient.

Based upon this practice of manual compression, Grunert invented and described in 1889 a so-called respiratory chair. In this apparatus a series of clamps are arranged to embrace the chest of the patient: these clamps are attached to levers worked by the patient's own hands. The patient is seated in the chair, the clamps are arranged on the chest,

and the levers grasped by the patient. During each act of expiration the patient presses on the levers and renders the act of expiration much more complete. The inventor cites a number of cases in which this apparatus has been used with benefit to his patients. The apparatus certainly offers an effective means of forced expiration, but as for general utility, it is not to be compared to the pneumatic cylinders.

Several forms of apparatus to compress the thorax mechanically have been invented, but they need not be described here.

Treatment of the Complications.—The chief complications to which the patient suffering from emphysema is subject are asthmatic attacks, bronchitis, heart lesions, and kidney lesions.

ASTHMA.—The article on "Asthma," by Dr. Whittaker, so thoroughly discusses this subject that it is hardly necessary for the writer to do more than point out the line of treatment which in his hands has seemed most useful in these cases.

On no occasion will the physician have a better opportunity of making a favorable impression on a patient than at this time. A hypodermic injection of $\frac{1}{4}$ of a grain of morphine, combined with $\frac{1}{100}$ or $\frac{1}{60}$ of a grain of atropine and $\frac{1}{100}$ of a grain of nitro-glycerin, will usually begin to give relief in fifteen minutes, and in half to three-quarters of an hour the relief will usually be complete. The writer has habitually used the above combination with the happiest results. The addition of nitro-glycerin to the well-known formula of morphine and atropine certainly adds much to its power of relieving the above-described symptoms. The nitro-glycerin does good by dilating the arterioles all over the body, and thus relieving the overburdened heart. If one dose of the foregoing is not sufficient to relieve the symptoms, it may be repeated in half an hour to one hour as circumstances indicate.

Hypodermic injections of cocaine hydrochlorate have been recommended by Dr. Thomas Dunn for the relief of attacks of spasmodic asthma, and might be tried in asthma from emphysema if for any reason the above prescription cannot be used.

If the patient is suffering from suppression of urine, and this secretion has been albuminous and has contained casts, then the use of morphine will be contraindicated and the nitro-glycerin may be used alone.

Venesection was largely used in early times to relieve the dyspnœa caused by the overburdened right heart. This practice has recently been revived with good results. Dr. Lafleur recently published a series of cases in the *Medical News*. That such treatment will relieve the symptoms there can be no doubt, but the writer must confess that, having seen the measures detailed above meet with such markedly good results, he would hesitate before drawing blood.

A patient who is subject to such attacks of asthma should be given a remedy that he can use in the absence of a physician. The sufferer may be supplied with a vial of a 1 per cent. solution of nitro-glycerin, and be directed to take 1 drop every fifteen minutes in water until the symptoms are relieved. He should be directed to notice the symptoms produced by the drug, and if there is much tinnitus or dizziness, with intense feeling of fulness of the head, the dose should be taken every half hour instead of every fifteen minutes. A vial of amyl nitrite may be supplied, and a few drops placed on a handkerchief and inhaled until relief is obtained or physiological symptoms such as are produced by the nitro-glycerin appear. When the physiological symptoms pass off, then the inhalation may be resumed.

Dried stramonium-leaves may be smoked by the patient during his attack, and frequently give much relief. They may be rolled into cigarettes and smoked, or they may be smoked in a pipe.

TREATMENT OF THE ACCOMPANYING CATARRH.—No one affected with emphysema is free from recurring attacks of bronchitis. Indeed, the Laennec theory of its causation is based upon the assumption that the inspiratory pressure is greater than the expiratory pressure. The bronchioles become plugged with mucus during an attack of bronchitis; the air which is inspired dilates the air-vesicles, and the expiratory pressure is insufficient to expel the secretion. This continues and a permanent dilatation is produced. On the other hand, the adherents of the expiratory theory hold that the bronchioles become plugged during a bronchitic attack—that the *expiratory* pressure is greater than the inspiratory, and, owing to the difficulty in expelling the air imprisoned in the air-cells, they are dilated by the strong expiratory efforts. Whichever of these theories is correct, or if there is truth in both, as seems most likely, bronchitis is looked upon as a causative factor in the production of emphysema. It is a well-recognized fact also that all persons affected with emphysema are subject to repeated attacks of catarrh of the respiratory mucous membranes.

Prevention of such attacks should be the object of the first efforts of both patient and physician.

Climatic treatment of the recurring catarrhs is probably the most rational of all methods, and should be employed whenever the time and means of the patient will admit of it. A climate should be selected for each case according to its needs. Where there is good bodily strength, a colder bracing climate can be selected than where the case is weak and needs careful watching as to excesses in bodily exercise. In all cases the two things to be desired and selected are equability of temperature with comparative dryness of the atmosphere.

However much the climatic treatment is to be desired, the vast majority of cases will not be able to avail themselves of it on account

of the cost and loss of time. Such cases must be treated at home, and can be successfully managed in many cases.

Exercise in the open air is desirable as directed above, and in order that this may be undertaken without danger the clothing must be of such a character that the person will be protected from the sudden changes of temperature so common in our most harassing climate. For this purpose wool should be worn next to the skin winter and summer, the weight of the material being lighter in the summer months and heavier in winter. The under-shirts should have high necks and sleeves reaching to the wrists; the drawers should be long enough to reach to the ankles. Wool as a good non-conductor of heat prevents the sudden chilling of the body, and its comparatively light weight makes unnecessary the weighing down of the body by additional coats and jackets, such as is habitually seen among the poorer classes of society.

Cold bathing indulged in daily may be undertaken by the more robust. It keeps the skin in good condition, invigorates the whole body, and renders the patient less susceptible to variations of temperature. If daily use of the bath causes discomfort in any way, it may be used three times a week or less frequently. The feet should always be kept warm and dry. So long as the patient is exercising, dampness of the feet does not so much matter, but as soon as the patient is at rest the damp stockings should be removed, friction applied to the feet, and dry stockings and shoes replace the damp ones. Woollen stockings with good stout leather shoes are preferable to lighter shoes covered with rubber overshoes. The latter prevent evaporation from the feet, and if long worn cause the very dampness they are intended to prevent.

A beginning cold can frequently be aborted by following Dobell's advice, given in his excellent treatise on *Winter Cough*. Such attacks are evidenced by chilly sensations, "stuffiness" of the head from beginning coryza, aching limbs, and more or less cough.

The patient is directed to take the following prescription at one dose:

℞. Ammonii carbonat., gr. v;
Morphinæ sulph., gr. $\frac{1}{8}$;
Syrupi acaciæ,
Aquæ, āā. f℥ss.—M.

At bedtime he is to take $1\frac{1}{2}$ ounces of solution of the acetate of ammonium. He is to be wrapped in a blanket on retiring, and to remain in the house during the following day.

Every "cold" prevented from developing into an attack of bronchitis prevents that much strain to the already weakened lungs. If

the patient is seen in the first stage of bronchitis with dry cough, oppression under the sternum, with a tearing feeling in the chest with each paroxysm of coughing, with somewhat indistinct breath-sounds and a few sibilant râles, the following mixture has been found by the writer to be of signal value in increasing the secretion and relieving the engorged condition of the mucous membranes:

℞. Potassii bromidi, ʒij;
Potassii citratis, ʒiij;
Syrupi ipecac., fʒss;
Succi limonis, fʒiss;
Syrupi, q. s. ad fʒiij.—M.
Sig. Dessert-spoonful every two hours.

If the cough is unusually harassing, and by preventing rest causes loss of strength to the patient, the addition of $\frac{1}{25}$ to $\frac{1}{10}$ of sulphate of codeine or sulphate of morphine to the mixture will enhance its value. The potassium bromide in the mixture helps to overcome the spasmodic condition always present in such cases, while the potassium citrate and ipecac increase the secretion in the respiratory tracts.

If the attack is an exacerbation of a more or less chronic condition, the breathing is rapid, and the chest full of mucous and sibilant râles, then the following mixture is of the utmost value:

℞. Potassii iodidi, gr. xxxvj;
Ammonii chloridi, ʒj;
Syrupi scillæ, fʒiij;
Misturæ glycyrrhizæ co., q. s. ad fʒiij.—M.
Sig. Two drachms every two or three hours.

Iodide of potassium in the writer's hands, as in the hands of most observers, has been of the greatest value. It has been lauded by some as a veritable cure for emphysema. Certainly it gives great relief in those attacks of bronchitis characterized by dyspnœa with the whole chest full of sibilant râles. It relieves and prevents the actual attacks of asthma to which the patients are subject, for which relief they are most thankful. The writer has seen patients who were so oppressed with dyspnœa, the breath-sounds being indistinct with prolonged sibilant expiration—in other words, in a sort of chronic asthmatic condition, and so unfitted for their duties that mere exercise was scarcely possible—so much relieved by a few doses of iodide of potassium in the foregoing mixture that they would declare themselves well, and the examination of the chest reveal entirely different conditions from those observed before the administration of the drug.

The dose of the iodide may be as great as 10 to 15 grains every three hours, though 5 grains every three hours is usually sufficient. The size of the dose is usually to be regulated by the urgency of the dyspnœa: the greater the dyspnœa, the greater the dose. Enormous doses can be borne by some such cases without causing any physiological symptoms.

If in addition to the dyspnœa there is weakness of the heart, with cyanosis, the patient should be given with the iodide 5 drops of tincture of digitalis, with 5 drops of tincture of nux vomica, every three hours. In all cases the patient should be at rest and not exposed to extremes of heat and cold, and in severe cases should certainly be at rest in bed. Rest in these severe attacks is of the greatest importance; some cases, which drag along for days while up and about, will respond at once to treatment when at rest in bed.

For the chronic bronchitis so generally present in winter in cases of emphysema doses of the above mixture of iodide of potassium and chloride of ammonium, given every four hours, are of great value.

Some cases with much expectoration and continuous cough respond well to oil of eucalyptus in 15-drop doses every three hours, dropped on sugar or given in capsule.

Terebene under the same conditions is sometimes of value, given in doses of 15 drops every three hours.

If there is a tendency to exceedingly large amounts of expectoration, with physical signs of a dilated bronchus, blowing breathing over the positions of the bronchi anteriorly or posteriorly, then inhalations of creasote, either by one of the numerous respirators on the market—of which, perhaps, Yeo's is as simple and cheap as any—or inhalations of eucalyptol from one of the various atomizers, may be tried.

In all cases the bowels should be regulated, it being seen that one good free movement is had daily. If this cannot be obtained normally, the following pill may be used with benefit:

℞. Aloini,
Resinæ podophylli, āā. gr. iij;
Extract. cascaræ sagradæ, gr. xij.—M.
Fiat in pil. No. xxiv.
Sig. One pill three times a day.

Cod-liver oil is unquestionably of great value when it is well borne by the stomach, but if it disagrees it does more harm than good, and should be omitted from the treatment.

Treatment of the Cardiac Complications.—The distension of the air-cells brings about, through the thinning, atrophy, and final disappearance of their walls, an obliteration of the terminal branches

of the pulmonary artery. This finally causes a gradual dilatation of the right side of the heart, connected with more or less hypertrophy, and finally of the left ventricle as well. The dilatation of the right ventricle under these circumstances has its most marked physical sign in the epigastric impulse. Owing to the distension of the parenchyma of the lungs, and consequent obliteration of the cardiac dulness, it is always difficult and frequently impossible to outline the limits of the right heart; consequently, the epigastric impulse becomes the chief physical sign. In some cases the dilatation is so great that the tricuspid valve becomes incompetent and a murmur results, systolic in time, with its area of maximum intensity just to the left of the sternum, at the junction of the sixth and seventh ribs. This murmur is rare, however. In the great number of extreme cases noted in the medical dispensary of the University of Pennsylvania but few instances of it are recorded. The symptoms are those of heart failure under any circumstances, œdema of feet, urgent dyspnœa, especially on exertion, œdema of lungs, and general cyanosis. Under such circumstances digitalis is the main stay of our treatment.

It should be given in doses of 1 fluidrachm of the tincture in twenty-four hours for the first two or three days, and then gradually reduced. This is the best possible mode of administration. Careful watch must of course be kept upon the pulse in order to detect the physiological action of the drug. Such a mode of administration, however, is less likely to be followed by untoward results than any other. Under these conditions strychnine or nux vomica can be pushed to its fullest extent with the best possible results. Strophanthus in the form of the tincture in doses of from 5 to 10 drops every three hours may be used with benefit. Sparteine sulphate can also be tried in doses of $\frac{1}{2}$ a grain four times a day, given either in pill or solution.

Iron and arsenic are of signal value in strengthening the flagging power of the heart. They may be administered as already advised, but can, and should under these circumstances, be pushed to their fullest extent. Above all other means of relief, and without which drugs are frequently of but little avail, is rest in bed. A patient suffering from a failing heart at rest in bed or reclining during the day in a chair will respond much more quickly to the use of digitalis and strychnine than when allowed to be up and about. All such patients should avoid any form of severe exertion. They should especially shun outdoor exercise in *windy* weather. The writer has in mind a man with organic disease of his heart, with such perfect compensation that he was entirely unaware of his illness, who was brought very near death by an acute pulmonary congestion brought on by walking in a high wind. In the attacks of dyspnœa which come on under such circumstances, and which partake largely of the nature of cardiac asthma, adminis-

tration of nitro-glycerin by the mouth, 1 drop of a 1 per cent. solution every half hour, as directed for the attacks of asthma so common in emphysema, is of the greatest benefit. Hoffman's anodyne may be used in half-drachm or drachm doses well diluted. Whiskey or some other alcoholic is useful, and it may be given in table-spoonful doses every half hour until some effect on the pulse is noticed. Hypodermic injections of nitro-glycerin and strychnine are also of great benefit. The latter may be given in the dose of $\frac{1}{30}$ grain every three hours. For hypodermic use it is best obtained in the form of tablets manufactured by the various manufacturing chemists.

Treatment of the Renal Complications.—The kidneys, as the other organs, partake of the general congestion, and help to make the condition of the patient more serious and more distressing. Albumin in the urine, hyaline casts, and sometimes granular casts, with increasing œdema, which may become general, together with headache, scanty urine, perhaps in extreme cases uræmic complications, show that there is present an actual disease of the kidneys. The treatment here is rest in bed, milk diet, digitalis, and diuretics. The diuretic which has given the most general satisfaction to the writer is 10 to 15 grains of acetate of potassium in an ounce of the decoction of scoparius (broom), given every two hours until a free flow of urine is obtained. Another favorite prescription is the following:

℞. Nitro-glycerin. (1 %), gtt. xij;
Caffein. citrat., gr. xvj;
Aquæ, q. s. f℥ij.—M.
Sig. One tea-spoonful in water every half hour.

This will frequently start a flow of urine which will eventuate in much improvement of the symptoms described. In this condition Basham's mixture, with the addition of $\frac{1}{20}$ grain of strychnine to the dose will be found of value.

ATELECTASIS PULMONUM.

It was not until 1844 that Legendre and Bouilly[1] discovered that the lesion so commonly supposed to be a catarrhal pneumonia was in reality a return of the lung to the fœtal condition. The treatment of pneumonia at that time being debilitating in character, comprising copious venesection, purgation, and use of tartar emetic, this discovery was of the utmost importance to the welfare of the patients supposed to be affected with catarrhal pneumonia. Pneumonia is a disease characterized by inflammation, and was looked upon by the

[1] *Archives générales de Médicine.*

therapeutists of that day as calling for depleting treatment. Atelectasis, the condition so frequently mistaken for it, especially in children, is a disease of weakness, of lack of power in the whole organism, and characterized by a more or less complete collapse of the pulmonary tissue. To bleed such a patient was to entail almost certain death, and hence one reason for the large mortality in the pneumonia of childhood at that time.

With the discovery of the true pathology of atelectasis, the treatment has changed, and instead of the patient being bled to his death, he is now supported by vigorous methods until the lung has an opportunity to resume its normal condition.

Two great divisions of this most important disease are recognized by writers on the subject: *congenital atelectasis*, or that which is caused by accidents at the birth of the child, in which the lungs retain their prenatal condition after birth; and *acquired atelectasis*, in which the once normal and healthy lung for some reason, either local or general, returns to its fœtal condition or collapses. This latter condition is given the name, by some writers, of pulmonary collapse, as distinguished from the congenital condition.

Congenital Atelectasis.

Treatment of this condition resolves itself into the treatment of stillbirth. This state depends in certain cases upon circumstances which are remediable. Hence the prophylaxis of stillbirth is properly briefly spoken of in this place. Fuller and more explicit directions may of course be found in all standard obstetrical works. Quickly-repeated, long-continued labor-pains where the maternal parts are small or rigid, by interfering with the placental circulation, is one of the great causes of stillbirth. Even at this late date ergot is frequently administered to women in labor to hasten or strengthen their labor-pains. This is, of course, an entirely unwarranted use of the drug, and is against the best teaching. It need only be mentioned here as one of the conditions precipitating the above-described state, and to be dismissed with the admonition to the physician to delay the use of ergot in labor until the uterus is empty. The administration of quinine in doses of 15 to 20 grains, repeated every half an hour, will usually encourage the pains in a marked degree. The proper employment of forceps of course will always make unnecessary any such use of ergot as I have spoken of.

Care in the preservation of the membranes will frequently prevent the marked interference with placental circulation which results in devitalizing the child. Search should always be made for the cord about the neck, that it may be released as soon as possible and the placental circulation allowed to continue.

The proper administration of chloroform to the woman in labor will frequently prevent atelectasis. Insufflation of liquid by the child is one of the most frequent causes of the non-inflation of the lungs. Care should be taken that all liquids are swept away from the mouth before the child has an opporunity to breathe. When the child is born with a "caul," or with the membranes unbroken, it will frequently attempt to breathe before the rupture of the membranes, and hence inspire much of the amniotic fluid. This, of course can be remedied by rupture of the membranes as the head protrudes from the vulva. This should always be done, and the physician should never allow himself to omit rupturing the membrane for the purpose of pandering to the silly prejudice which attaches to the "caul." The head in breech presentations should always be delivered with as much rapidity as possible, in order that the child may breathe before the maternal circulation is too seriously interfered with. Due care must be taken in the use of the obstetric forceps that the pressure is not so great that the respiratory centres are interfered with, thus causing a lack of power in the child to take inspirations sufficiently forcible to inflate the lungs.

Two well-marked forms of stillbirth exist: the *anæmic*, in which the child is pale, cold, limp, and entirely without respiratory or other movement; and the *cyanotic* form, in which the child is cyanosed, rigid, and makes abortive attempts at breathing. The first form is much the more serious condition of the two: the atelectasis is almost complete and the vital energy of the infant almost *nil*, only a faint heart-beat revealing the existence of life. In the latter condition the lungs are only partially atelectatic, the abortive respiratory movements having had the effect of slightly inflating the lung.

Treatment of the Cyanotic Form of Stillbirth.—This is usually a simple matter, the difficulty always increasing as the anæmic form is approached. The cord is left untied. The nares and throat should be cleared and the mouth rid of mucus and other foreign material that may be found. This may be done by introducing the finger, first covered with a soft cloth, into the nares and mouth. It is best that the finger should be covered with the cloth, for the mucus will adhere more readily to it than to the naked finger, and there is less danger of injuring the child by the operator's finger-nail.

Cold water may then be dashed over the face and body of the infant. This will usually cause it to take a deep inspiration, to be followed shortly by regular respiratory movements.

Finally, the body of the child may be slapped or brisk frictions made. Failing in this simple means of restoration, it is advised by some that the cord be cut and from 1 to 2 drachms of blood allowed to escape. This seems to the writer to be bad practice: the child has no

more blood than is necessary; all that is wanted is its proper distribution and proper respiratory movements.

If all these methods fail, the cord is at once to be tied, and one of the methods of artificial respiration presently to be described is to be used.

Treatment of the Anæmic Form of Stillbirth.—In this variety the infant has every appearance of death, except the important fact of the feebly-beating heart. So long as the heart beats, be it ever so feebly, there is reasonable hope that the child's life may be saved. The cord must at once be tied, and no time lost before performing artificial respiration. First, the mouth and nares must be cleared, as previously directed, of all material which interferes with the ingress and egress of air. If this fails to remove the mucus, a catheter may be introduced into the trachea, compression made on the trachea below the end of the catheter, and air blown in forcibly. This will blow the mucus out of the mouth and nose. This method, recommended by Champneys in his excellent work on artificial respiration in 1887, is much to be preferred to evacuating the mucus by suction, as is generally recommended. Care must of course be taken that the catheter enters the trachea, and not the œsophagus. It is not a simple matter to pass a catheter into the trachea of a newborn child. It can best be done by introducing the finger into the mouth and placing it over the epiglottis. Using this for a guide, the catheter may be gently slipped into the trachea. Pressure should be gently made over the præcordia in order to stimulate the circulation.

Numerous modes of bringing about breathing in the child with congenital atelectasis have been advised. It will not be necessary to describe all here, as reference may be made to works on obstetrics, and especially to Champneys' work referred to above.

One of the best methods is mouth-to-mouth respiration, which may be performed by placing over the mouth and nose of the child a thin cloth, and through this blowing forcibly directly into its mouth. The air is then expelled by making strong pressure on the sides. This movement may be repeated fifteen to twenty times a minute.

Sylvester's method has in the hands of the writer been most successful, and by it he has certainly seen more than one child saved. The child is laid on its back, with its shoulders raised and supported with a folded article of dress. The tongue is drawn forward (if the glottis remains persistently closed a catheter may be introduced, and allowed to remain during the manipulations). The feet are held securely by an assistant. The arms are then seized above the elbows and *everted;* this eversion puts the tendon of the pectoralis major on the stretch, and thus gives better leverage on the chest-walls. The arms are then drawn upward alongside of the head, or, as the author prefers, *outward*

and upward, and held in that position with gentle traction. The arms are then brought down alongside of the chest and gentle pressure made upon the chest-walls. These movements are repeated fifteen to twenty times a minute. Great care should be taken that the movements are not repeated too frequently. I know of no temptation greater than to hurry under these circumstances. This method is simple and causes but little disturbance of the child.

Schultze's method, which is probably but little known or used in this country, has many advantages, but some disadvantages. If, however, Sylvester's method fails, it may be tried with a hope of success. The cord is to be tied. The child is seized from behind with both hands by the shoulders, in such a way that the right index finger of the operator is in the right axilla of the child from back forward, and the left index finger in the left axilla, the thumbs hanging loosely over the clavicles. The other three fingers hang diagonally downward along the back of the thorax. The operator stands with his feet apart and holds the child in the above-described manner, practically hanging on the index fingers in the first position, with the feet downward, the whole weight resting on the index fingers in the axillæ, the head being supported by the ulnar borders of the hands. This the first inspiratory position. At once the operator swings the child gently forward and upward. When the operator's hands are somewhat above the horizontal the child is moved gently, so that the lower end of its body falls forward toward its head. The body is not flung over, but moved gently until the lower end rests on the chest. In this position the chest and upper end of the abdomen are compressed tightly. The child's thorax rests on the tips of the thumbs of the operator. As a result of this forcible expiration the fluids usually pour out of the nose and mouth of the infant. The child is allowed to rest in this position (the first expiratory position) about one or two seconds. The operator gradually lowers his arms, the child's body bends back, and he again holds the infant hanging on his index fingers with its feet downward; this is the second inspiratory position. These movements are to be repeated at least fifteen or twenty times in the minute.

Respiration being established, the child should be wrapped in a woollen covering and laid on its right side, with head somewhat raised.

This section cannot be better ended than by quoting Champneys' final words:

"Do not hurry: it is not a question of seconds, and success depends upon a fine exercise of the judgment. Make a good diagnosis first as to life or death; secondly, as to the stage of asphyxia. If the child is macerated, it is obviously dead and past hope. If the heart beats ever so slowly and feebly, it is not dead. If the heart is

not beating, death is not certain unless it can be proved to have been inactive for a long time. If the child is livid and not flabby, it will probably come round; wipe out its mouth and pharynx, rub down the spine, and press gently over the cardiac region. If this produces no effect, or if in the pale stage, inflate the lungs by the mouth and by Sylvester's method. If air enters the lungs, well and good; if not, try Schultze's method or insert a catheter. . . . . Never be content until the child breathes regularly and appears to be continually improving."

On the days succeeding the birth the child's peripheral circulation may be hastened and aided by gentle friction over the body with alcohol. The child when weak should be kept on its right side, to aid in closure of the foramen ovale. If the circulation is very feeble, 6-drop doses of whiskey every hour may be given, well diluted. If the infant is too feeble to nurse, the breast-milk must be drawn by aid of a pump —one in which the air is withdrawn by suction with the mouth— and the milk given by means of a spoon.

Acquired Atelectasis.

Pulmonary collapse, the name given to this condition by Meigs and Pepper and other authors, was, as before stated, considered an inflammatory condition until its true pathology was pointed out by the French observers. This condition can occur at any age, but is most common in infancy. It is especially liable to follow and complicate a low adynamic condition, such as typhoid fever in the adult. It is not an infrequent complication of pneumonia, especially when the general condition of the patient is much reduced for any reason. It is especially common in weak and ill-nourished children affected with whooping cough and measles, and is a most common cause of death in these diseases. Knowing that atelectasis is a frequent cause of death in such conditions, the wise physician guards by all possible ways in his power against this complication. Children who are weak from inheritance or their surroundings are especially liable to this disease. If such a child is stricken with whooping cough or measles, it is the first duty of the physician to improve in every way the surroundings of the patient and his general strength. Practice among the poor with children and adults crowded indiscriminately in ill-ventilated rooms, ill-fed and worse nursed, is an entirely different employment from that among the rich, who are able to surround themselves and their children with every comfort. For the latter it is an easy matter to obey the commands of the physician and remove the child to the country or seashore. For a woman with an artificially-fed child, with five or six other children between infancy and puberty, with no money except for the mere necessities of life, it is an impossible task. Fortunately, however, the charitably disposed of our great cities

have made it a comparatively easy task for the physician to have his poor patient removed from the crowded tenements and enjoy the fresh air of seashore and country. When possible a child who is able to be moved, and who has a partial or threatened atelectasis, should be sent away from the crowded parts of the city, that its body may receive vigor from the fresh air and pure food. If this is impossible, then the mother should be encouraged to give the child exercise in the fresh air by taking it to the various parks accessible from all of our cities. Good food should be furnished, and tonics containing iron and strychnine given.

The compound syrup of hypophosphites, used in half tea-spoonful doses, well diluted and repeated every three hours, has been a most efficient remedy in my hands for improving the tone of the weak children which flood our cities. All this could and should be done as a prophylactic measure.

Besides whooping cough and measles, the diarrhœa which is such a fertile source of death among infants in cities is another cause which acts by its debilitating effect in bringing on severe attacks of atelectasis. Here the prophylactic measures above alluded to are eminently proper. The additional measure of care of the food must be taken with especial consideration. This subject is fully treated of in the article on Entero-colitis, but the author thinks it not out of place to give a few simple rules here for the guidance of the reader.

As is well known, entero-colitis occurs with far the greater frequency in artificially-fed children, and the selection of food becomes at once a most serious question. Cow's milk, when it can be secured in a good degree of freshness and purity, is undoubtedly the best substitute for mother's milk. The patients should be instructed to avoid purchasing that which has been hauled about the city for hours, and if possible it should be served twice daily. There are numerous reliable dairies in Philadelphia, and they doubtless exist in other cities, where pure milk can be obtained daily. It is part of the duty of the physician to make himself familiar with these places, and insist on his patients purchasing from them. Pure milk being obtained, it should be sterilized in the summer months. It is out of the question for many of the poor to purchase the patent sterilizer, and is probably unnecessary. Most efficient sterilizing can be done by the use of the ordinary boiler found in the poorest family, and some support for the bottles, such as an iron stand used for holding flat-irons. The stands are placed in the bottom of the boiler, and water poured in until it reaches almost the top of the stand. A number of bottles—the ordinary nursing-bottles answering perfectly—are well cleaned and filled with the milk, and stoppered with raw cotton which has been singed in a flame. The bottles are then placed on the stand in the

bottom of the boiler, the whole covered with a rather loose-fitting lid, and boiled from thirty to fifty minutes. The bottles should remain corked until the milk is to be used. This milk may be diluted one-half with lime-water or barley-water, and fed to a three months' old child in amounts of four ounces every two hours.

The milk may be predigested by the aid of Fairchild's peptogenic milk powder, which makes a most wholesome food.

If it is impossible to get good milk, or if the child cannot digest milk under any circumstances, then recourse must be had to some of the artificial foods. As a food malted milk has been a most useful one in the hands of the writer, and has the advantage of being easily prepared.

It would be manifestly out of place to go into the medicinal treatment of diarrhœa, but the writer cannot refrain from advising the use of salol in all cases of entero-colitis of children. Combined with bismuth and chalk mixture in such a prescription as follows, it will be found of signal value:

℞. Saloli, gr. xlviij;
Bismuthi subnit., ʒiss;
Mist. cretæ, q. s. fʒij.—M.
Sig. One tea-spoonful every two hours for a child one year old.

The bronchitis which accompanies and follows measles must be appropriately treated. As previously urged, tonics and hygienic surroundings are of paramount importance. Syrup of hypophosphites, cod-liver oil, and massage are of importance. The bronchitis is best treated by some such mixture as follows:

℞. Potassii bromidi, gr. xxxij;
Ammon. chloridi, gr. xxxij;
Syrupi scillæ, fʒij;
Syrupi tolutan., fʒj;
Aquæ, q. s. fʒij.—M.
Sig. One tea-spoonful every two or three hours.

If the bronchitis is capillary and the child weak, the addition of 2 grains of carbonate of ammonium to each dose of the prescription, and the omission of the squill, will be indicated.

The whooping cough may be treated with the above mixture used for the bronchitis, and the addition of belladonna to control the paroxysms. For belladonna to be of value it should be given in full doses. It is always directed to be given alone; for a child one year old 2 drops are ordered every two hours, to be increased until flushing

of the face or dilatation of the pupil is noticed after each dose. The bromide may be increased in the prescription suggested for the bronchitis until the child shows signs of bromism.

True Atelectasis.

A child with whooping cough, measles, pneumonia, or diarrhœa, or an adult with pneumonia or typhoid fever, may be progressing in an entirely satisfactory manner when suddenly atelectasis will supervene. This will be noted by sudden more or less severe cyanosis, coldness of the extremities, dyspnœa, and shallow respirations. The physical signs will be inspiratory retraction of the intercostal spaces when there is much lung involved, a dull or tympanitic percussion note, and faint vesicular breath-sounds. Under such circumstances the time for active measures has come. If the patient is suffering from pneumonia, and atelectasis of the unaffected lung has taken place, and whiskey and digitalis have already been used, they must now be pushed to their fullest extent. Strychnine may be used hypodermically in doses of $\frac{1}{30}$ grain repeated every three hours. Here hypodermic injections of nitro-glycerin, repeated every hour, will give excellent results in toning up the flagging heart. In children whiskey is perhaps the most reliable stimulant. The writer once administered to a child three months old, nearly dead from atelectasis complicating bronchitis, 15-drop doses of whiskey every fifteen minutes, with the result that the cyanosis disappeared, the heart became regular, and final recovery took place. Carbonate of ammonium, a good cardiac stimulant, may be used in the adult in doses of 10 grains repeated every one or two hours. Sinapisms to the chest are a most efficient mode of stimulating the weakened respiratory muscles.

GANGRENE OF THE LUNG.

Probably the most important element to be taken into consideration in the prognosis of a case of pulmonary gangrene is the condition of the patient previous to the manifestation of the disease. When a patient suffering from pneumonia, instead of progressing favorably to resolution, begins to expectorate fœtid material containing gangrenous lung-tissue, with the sputum separating into three layers, so diagnostic of gangrene, there is the temptation for us to say, "All is lost!" Literature, however, abounds with cases of undoubted gangrene of the lung that have recovered after a more or less prolonged course. A very generally favorable element in all the cases is the excellent condition of the patient when attacked with the gangrene; therefore, if

we have a case of pneumonia in which the affected area has become gangrenous, or a case of foreign body in the lung which has caused a gangrenous focus, it behooves us to do all that is possible for the recovery of our case, instead of making up our minds that the patient will die and sitting by with folded hands.

Prophylaxis of gangrene of the lung is an important point in the treatment of all cases of pulmonary disease. The treatment of putrid bronchorrhœa, which so frequently antedates gangrene of the lung, is of the utmost importance. Improvement of the surroundings of the patient, with a liberal supply of fresh air and nourishing food, is necessary. The use of antiseptic mouth-washes and inhalations of carbolic acid, either dissolved in hot water or from one of the various respirators, to be used more or less constantly, will be found of value. Eucalyptol may be employed in the same way, or it as well as carbolic acid may be inhaled from one of the various steam-atomizers.

Since gangrene of the lung is a frequent occurrence in lunatics, improvement of the hygienic surroundings of such patients is important. When artificial feeding becomes necessary, care should be taken that particles of food are not introduced into the air-passages and by their presence there give rise to gangrene.

Traube has suggested the use of acetate of lead in pill form in 1-grain doses, repeated every second hour. He combines with this, when the fœtor has nearly subsided, $\frac{3}{4}$ to $1\frac{1}{2}$ grains of tannic acid. Chlorinated lime in doses of 30 grains has also been used. Carbolic acid may be given either in capsules or, preferably, in wine. It may be prescribed in the following manner:

℞. Acidi carbolici, gtt. xxiv;
Vini xerici, f℥vj.—M.
Sig. One table-spoonful every three hours.

The treatment by inhalations was first introduced by Skoda. The remedy most frequently used in this manner is oil of turpentine. This may be employed in one of the ordinary atomizers or by placing the turpentine in a cup of hot water and inhaling the fumes through an ordinary funnel.

Eucalyptol, which is probably as efficient as turpentine, has the advantage of a much more pleasant odor. It may be used in the same way. Carbolic acid may also be inhaled with benefit.

One of the most efficient vaporizers which has come to the notice of the writer consists of a chamber containing water, from the top of which leads a small exit-pipe ending in a mouth-piece filled with sponge. The substance to be inhaled is poured or dropped upon the sponge, and the water heated by means of a spirit lamp, which is fitted

to the apparatus. The steam passes out of the pipe, and through the sponge containing the substance to be inhaled. In this way most efficient vaporization of the substance is obtained.

While these measures may and should be undertaken in all cases of gangrene of the lung, the general treatment of the patient, together with that of the complications, is of the utmost importance.

Supporting measures must be at once adopted, and if, as will be most likely, the patient is suffering from some primary disease for which stimulants are being used, they must be supplemented by increasing the doses or adding other stimulants. Alcohol must be used in large quantities: the proper guide as to the amount of whiskey or brandy to be given, here as elsewhere when there is great depression, is not the amount used, but the effect upon the pulse and general condition of the patient. It should be increased until the pulse becomes fuller and stronger, until the dry tongue becomes moist, or until the delirium becomes less marked. So long as these improvements continue the alcohol may safely be increased: if the effect is the opposite from this, or if as an apparent cause of the large doses the pulse becomes weaker, the tongue drier, and the delirium increases, then it is time to lessen the dose.

Strychnine is a most excellent heart tonic, and is best given hypodermically. Certainly, the effect when administered in this manner is much more beneficial than when given by the mouth. In extreme cases $\frac{1}{30}$ of a grain may be administered hypodermically every three hours—at longer intervals of course when the symptoms are not so urgent.

Milk must be administered in large quantities; from three pints to two quarts in twenty-four hours.

Inhalation of oxygen has lately been advised as a useful method of treatment. This gas can now be obtained from manufacturers in receivers from which it can be directly inhaled.

Hæmoptysis, which is an occasional complication, must be met by the usual means of cold applications, ice by the mouth, rest, opium, and ergot.

Cough is best controlled by the judicious use of narcotics.

For the relief of the fever, quinine, administered in doses of 10 grains night and morning, is of the greatest value, both as a antipyretic and general tonic. The newer antipyretics, antipyrine and phenacetin, may be used in doses of 10 grains when the temperature becomes excessive. Remembering that the exhaustion produced by the disease itself is great and quite capable of causing death, antipyretics of the last-named group must be used with caution. It is the practice of the writer invariably to accompany the administration of these two drugs in antipyretic doses with a hypodermic injection of nitro-glycerin, and

to watch the effect of the antipyretic and repeat the nitro-glycerin if there is any tendency to collapse.

Catarrhal conditions of the stomach and intestine are frequently produced by swallowing the expectoration. These are best controlled by bismuth and opium. A favorite prescription in such conditions is the following:

℞. Morphinæ sulph., gr. j;
Bismuth. subnit., ʒij.—M.
Fiat in chart. No. xij.
Sig. One powder every two or three hours, as required.

Surgical treatment of gangrene of the lung in favorable cases offers in this age of antiseptic surgery perhaps the most hopeful means of procedure. If the gangrenous spot is situated near the surface, and can be definitely marked out, there is every reason to call in the surgeon to our aid. Several cases are on record where such procedure has resulted in saving the patient.

ABSCESS OF THE LUNG.

LITTLE is to be said upon the treatment of abscess of the lung which will not apply to the treatment of gangrene. In both, disinfectants, such as carbolic acid and eucalyptol, may be used by the mouth and by inhalation. Stimulants must be pushed as in gangrene of the lung, and the various complications treated in the same manner.

The surgical treatment of abscess of the lung has of late claimed the attention of physicians and surgeons. Many cases are on record which have recovered after surgical interference which had given every evidence of succumbing under purely medical treatment. If the abscess can be definitely made out, and is believed to be solitary and not multiple, everything points to the propriety of surgical treatment. This is manifestly not the place to describe the operation to be undertaken; it must be left to the good judgment of the surgeon consulted. However, when a case in which there is evidence of pus begins to fail, an exploratory puncture may be made to establish the diagnosis, and then active measures, either puncturing with a large trocar and inserting a drainage-tube, or making a free opening and giving vent through a large tube. This latter measure appears to have given much better results in the cases reported than the mere draining by a small opening.

Necessarily, stimulation, antipyretics, and general tonic treatment must be continued until the complete recovery of the patient.

ŒDEMA OF THE LUNGS.

ŒDEMA of the lungs is never a primary affection. Occurring as it does in the course of other diseases—notably, Bright's disease and organic heart disease—its treatment properly belongs to the consideration of the complications of those diseases.

However, as the physician occasionally first sees his patient with pulmonary œdema as the chief condition to be treated, it is perhaps best to consider it briefly in this place.

A patient with more or less cyanosis, urgent dyspnœa, frothy expectorations, and with his chest filled with mucous râles is suffering from an attack of pulmonary œdema. If this attack has occurred in the course of acute or chronic nephritis, diuretics, diaphoretics, and purgatives will probably give the best results. If the patient's heart is fairly strong, a hypodermic injection of from $\frac{1}{8}$ to $\frac{1}{6}$ of a grain of pilocarpine can be administered with good results, or the patient may be given a hot-air bath. A large funnel may be placed over a lighted spirit lamp, and the small end of the funnel inserted under the bed-clothing. In a very short space of time the air in the tent formed by the sheet will be superheated, and will bring on a profuse sweet. An efficient steam-bath may be originated in a few moments by filling bottles with very hot water and drawing over them stockings dampened in warm water, the bottles thus covered to be laid under the bed-clothing next to the patient. Diuretics will probably be less efficient, on account of the length of time it takes for them to act.

Purgatives in the shape of $\frac{1}{8}$ or $\frac{1}{4}$ of a grain of elaterium, or the compound jalap powder in drachm doses, may be given when the strength of the patient will allow it.

When these depleting measures are used it will be well to support the heart with hypodermic injections of strychnine, $\frac{1}{30}$ of a grain, or of 15 minims of tincture of digitalis, or 1 or 2 drops of a 1 per cent. solution of nitro-glycerin. If the œdema is dependent upon a weak heart due to organic heart disease or other cause, then the proper treatment is the free use of cardiac stimulants.

Hypodermic injections of a 1 per cent. solution of nitro-glycerin have been of signal value in the writer's hands. In the *Medical and Surgical Reporter*, June 2, 1888, the writer reported a series of cases of heart failure treated by this method. His experience since that

time has amply justified the conclusions drawn and confirmed him in its use. It may be given in doses of 1 drop in water every half hour until relief is obtained. Hypodermic injections of whiskey, strychnine, and digitalis should be given for their more lasting effects. By the mouth whiskey, Hoffman's anodyne, and aromatic spirit of ammonia may also be given.

In that form of œdema coming on in the course of fevers it will be well to change the position of the patient as frequently as practicable, in order to prevent a portion of the lung from being continuously in a dependent position.

HYPERÆMIA OF THE LUNGS AND PASSIVE CONGESTION OF THE LUNGS.

HYPERÆMIA of the lungs or active congestion, coming on from over-action of the heart, may cause so much embarrassment of the respiration that venesection is called for, but usually dry or wet cups to the chest, with hot mustard baths and the administration of full doses of aconite, will give the desired relief.

In such cases the disturbing element, if it be excitement or undue use of stimulants, must be removed. Where the condition is due to mental emotions, bromide of potassium in from 30- to 60-grain doses will be of benefit.

Passive congestion of the lungs, which usually occurs in the course of some adynamic fever, calls for an opposite mode of treatment. Here the heart is weak, and needs stimulation with whiskey, digitalis, and strychnine. The position of the patient in bed should be frequently changed, as in cases of œdema due to the same causes.

PULMONARY EMBOLISM.

WHEN emboli of the pulmonary artery have their origin in valvular lesions of the heart or in some septic focus, such as a puerperal uterus or an abscess, treatment must be entirely symptomatic. One form of emboli, however, those which have their origin in the clot of an occluded vein, may to a great extent be prevented by rational treatment of the inflamed vein. First among these prophylactic measures is rest. No patient with a phlebitis of the saphenous vein should be allowed out of bed until all symptoms of active inflammation have subsided, and until the clot is firmly adherent to the walls of the vessel. The limb should be kept in a slightly elevated position

and lightly bandaged with a flannel roller. When other veins are involved, due care should be taken that the clot is left undisturbed until absorption has begun to take place. If the infarcts to which the emboli give rise should suppurate, then the case becomes one of abscess or gangrene of the lungs, and should be treated accordingly.

TUMORS OF THE LUNG.

THE treatment of tumors of the lung is necessarily unsatisfactory, with the single exception of cystic tumors. Little beyond a general supporting treatment is available.

The distressing symptoms connected with respiration may be alleviated by rest, posture, and narcotics. Cystic tumors, when it is possible to diagnosticate them, may be incised and treated on surgical principles. Surgical interference with other varieties of tumors is of no practical value.

Echinococcus cysts may be treated as other cystic tumors, with possibly more hope of permanent relief. The cyst may be incised and thorough drainage kept up, in order, if possible, to get rid of all the hydatids.

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"The merits of Dr. Woodhead's *Practical Pathology* are already so well known to the profession that but few words are required on our part to commend it anew to their attention. The present edition retains all the good features of its predecessors, with a number of additional good qualities of its own. Great care has obviously been taken throughout in its preparation. It has been almost entirely re-written, much of it altered and re-arranged, and a great deal added. It forms now a volume of 652 pages, as compared with the 484 pages of the first edition. A notable feature of this work from the very first has been the great beauty of its coloured illustrations. In this respect, also, the merits of the book have suffered no abatement in the present edition. A large number of new illustrations have been added; and in every case where new ones have replaced those in the earlier editions, the change is an improvement. Both author and publisher are to be specially congratulated on this portion of their work. We can confidently recommend this work as one of the best practical treatises dealing with the subject of morbid histology that have appeared in this or any other country."—*British Medical Journal.*

"Woodhead's *Practical Pathology* has become one of the standard text-books for students of human pathology; indeed it may be said to have occupied that position ever since its first appearance nine years ago. For some time past the work has been out of print, and that fact must have caused considerable inconvenience to medical students, inasmuch as there is not in the market any book at all approaching it in usefulness as a guide to practical pathology. The scope of the work has been enlarged, the matter has been partially re-arranged, and the illustrations have been improved and increased in number. Taking text and illustrations together, the book is a model work of its class, and medical students of the present day are to be congratulated on having at their disposal such an admirable aid to the practical study of pathology. We strongly recommend it to both veterinary practitioners and students as the best book on the subject that is obtainable in the English language."—*Journal of Comparative Pathology and Therapeutics.*